WATER & SEWAGE WORKS

WATER SUPPLY • INDUSTRIAL WASTE TREATMENT • SEWAGE DISPOSAL

MARCH, 1953

Miami's 80 Ton Lime Production Plant....

$818,000 Investment Proven Sound After Three Year Test.

. . . a good pipeline

is the sum of good parts . . .

▲ *Testing the compressive strength of a concrete cylinder*

Testing the tensile strength of steel reinforcing wire ▶

The finest design and the most accurate workmanship cannot result in a superior product *unless* the materials used are of the highest quality. That's why Lock Joint assures the excellence of each of its pipes by constantly testing both the finished product *and* the individual materials used.

• • •

In the Company's research and testing laboratory reinforcing steel is tested for tensile strength . . . sand and aggregates are analyzed and classified . . . specimens of concrete in daily use are tested for compressive strength . . . gasket rubber undergoes varied and rigorous tests for elasticity and durability . . . *all* ingredients are definitely proven before they are allowed to be put to use.

• • •

These carefully tested materials, together with Lock Joint's conservative design and precise workmanship, result in a finished product unexcelled in the pressure pipe field. If your project calls for pipe 16″ in diameter or larger, designed for pressures common to water works practice, specify Lock Joint Concrete Pressure Pipe—the pipe that's tested from start to finish and backed by nearly half a century of pipe manufacturing experience.

SCOPE OF SERVICES *Lock Joint Pipe Company specializes in the manufacture and installation of Reinforced Concrete Pressure Pipe for Water Supply and Distribution Mains 16″ in diameter or larger, as well as Concrete Pipes of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous Lines.*

LOCK JOINT PIPE COMPANY

Established 1905

P. O. Box 269, East Orange, N. J.

PRESSURE PIPE PLANTS: Wharton, N. J., Turner, Kan., Detroit, Mich., Columbia, S. C.

SEWER & CULVERT PIPE PLANTS:

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LOCK JOINT
Reinforced Concrete
PRESSURE PIPE

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HOMELITE

When you buy a Homelite pump, generator, blower, or chain saw, you buy a superior product. You get outstanding performance and real dependability, the results of Homelite's 30 years' experience in manufacturing gasoline engine driven units. And with this, you get a plus . . . a big plus...*service* of unusual caliber.

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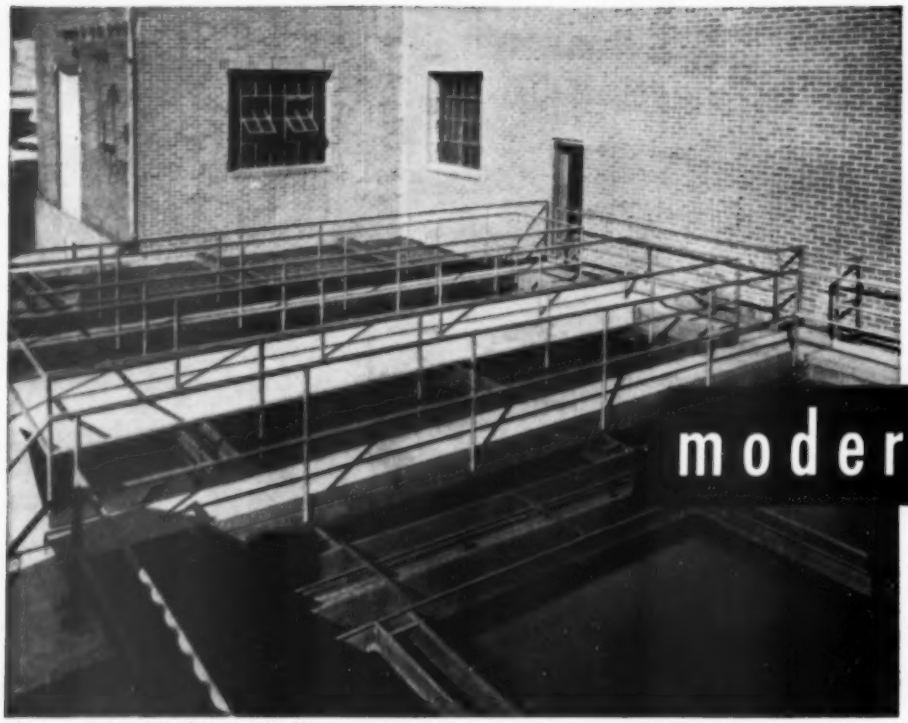

HOW NORTH KANSAS CITY modernized ITS IRON REMOVAL PLANT

Photo courtesy City of North Kansas City, Missouri

TO *triple* the 1912 rate of an old-fashioned settling basin and two filters could be a problem—and quite expensive.

Consulting Engineer Charles A. Haskins, solved it very economically. Two compact, modern Permutit Precipitators were built into the *old* settling basin. Operating on the highly efficient sludge-blanket principle, these Permutit Precipitators assure maximum operating economy.

The results of this modernization—detailed in the table below—speak for themselves:

- Total Iron reduced from 5.0 to 0.1 ppm.
- Manganese reduced from 0.2 ppm to essentially zero.
- Turbidity reduced from 50 to only 3 ppm—permits 19 hour per day filter runs with washing only once every 5 days!
- Hardness reduced to level desired.

For full details on the Precipitator write to THE PERMUTIT COMPANY, Dept. W-3, 330 West 42 St., New York 36, N. Y., or to Permutit Company of Canada, Ltd., 6975 Jeanne Mance St., Montreal.

Water Analysis Report Before and After Conditioning

		PPM as	Raw Water from wells before aeration	Precipitator effluent (unfiltered)
CATIONS	Calcium (Ca++)	$CaCO_3$	145	55
	Magnesium (Mg++)	$CaCO_3$	103	75
	Sodium (Na+)	$CaCO_3$	108	105
ANIONS	Alkalinity: Bicarbonate (HCO_3−)	$CaCO_3$	190	42
	Alkalinity: Carbonate (CO_3−−)	$CaCO_3$	0	24
	Alkalinity: Hydroxide (OH−)	$CaCO_3$	0	0
	Chloride (Cl−)	$CaCO_3$	35	35
	Sulfate (SO_4−−)	$CaCO_3$	146	139
	Total Hardness	$CaCO_3$	248	130
	Alkalinity A (Methyl Orange)	$CaCO_3$	190	66
	Alkalinity B (Phenolphthalein)	$CaCO_3$	0	12
	Free Carbon Dioxide	CO_2	16	0
	IRON (total)	Fe	5.0	0.1
	Silica	SiO_2	16.8	13.0
	MANGANESE	Mn	0.2	0.0
	TURBIDITY (after shaking)		50	3
	Fluorides	F	0.5	0.4
	Color		Turbid	5
	pH		7.3	9.5
	Total Hardness (as $CaCO_3$)	Result in grains per U.S. Gal.	15	7.6

WATER CONDITIONING HEADQUARTERS FOR OVER 40 YEARS...

PERMUTIT®

WATER AND SEWAGE WORKS. Reg. U. S. Patent Off. Published monthly by Gillette Publishing Co., at 404 North Wesley Ave., Mount Morris, Ill. Entered as second class matter Mar. 4, 1948, at the post office at Mount Morris, Ill., under Act of March 3, 1879. For subscription rates, see Contents Page.

WATER & SEWAGE WORKS

WATER SUPPLY • SEWAGE DISPOSAL
INDUSTRIAL WASTE TREATMENT

COMING ARTICLES

Fundamentals of Electricity for the Plant Operator ..... *Smith*
Effluent Rate Control for Water Filters ..... *Richardson*
Lowering Sewage Pumping Costs at Trenton, N.J. ..... *Condict*
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Treating Rendering Wastes—a New Process ..... *Farrell*
Experience With Impingement Aeration ..... *Kruegel*
Sewage Works Practices (Short course type articles*) ..... *Bloodgood*

* In this issue is the second of a series of short-course type articles, on *"Water Works Practices"* by Dr. Geo. E. Symons. Articles of the Bloodgood and Symons series will appear in alternate issues.

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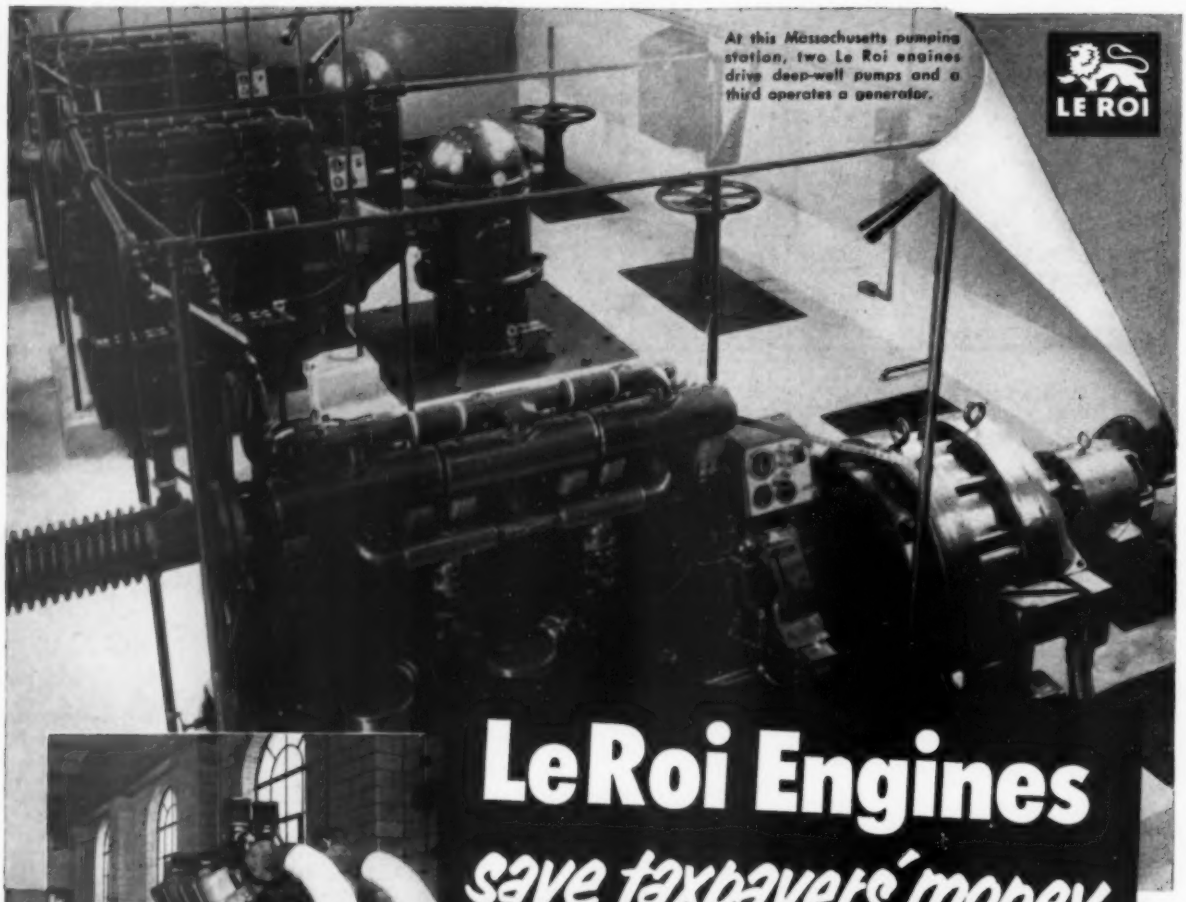
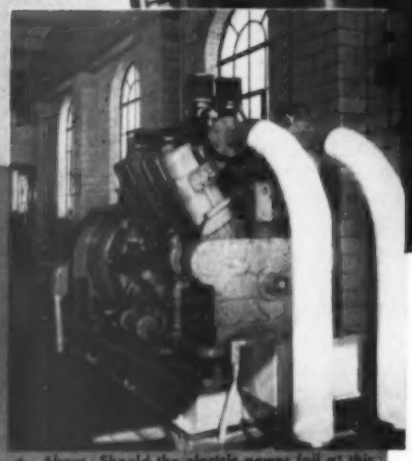


At this Massachusetts pumping station, two Le Roi engines drive deep-well pumps and a third operates a generator.

LE ROI

Le Roi Engines *save taxpayers' money*



▲ Above: Should the electric power fail at this Mississippi Lock and Dam, the Le Roi standby unit automatically swings into action — opening and closing locks or operating de-icers with consistent dependability.

Below: These two Le Roi engine-generator units operate on "no-cost" sewage gas, to produce electric power at a fraction of the cost of buying power at the utility rate. ▼

HERE are a few examples that prove you can cut operating costs by using Le Roi engines — for pumping, for generating electricity, for standby service.

A city in Wisconsin has two Le Roi generating units operating on sewage gas. These units have saved the taxpayers nearly $4000.00 a year for the past 14 years.

A town in Oklahoma cut pumping costs over 50% with a Le Roi engine operating on natural gas. Taxpayer savings — $7600.00 in the first 10 months of operation.

New York City uses 3 Le Roi 600 hp engines to provide 21,000 gpm standby capacity for its 179th Street pumping station. Here dependability is the prime factor.

Use dependable, low-cost Le Roi power and lighten the tax load in your community. Le Roi engines are available in sizes ranging from 20 to 600 hp — custom generator sets in sizes from 50 to 300 KW. They operate on no-cost sewage gas, natural gas, butane, or gasoline. Write today for detailed information.

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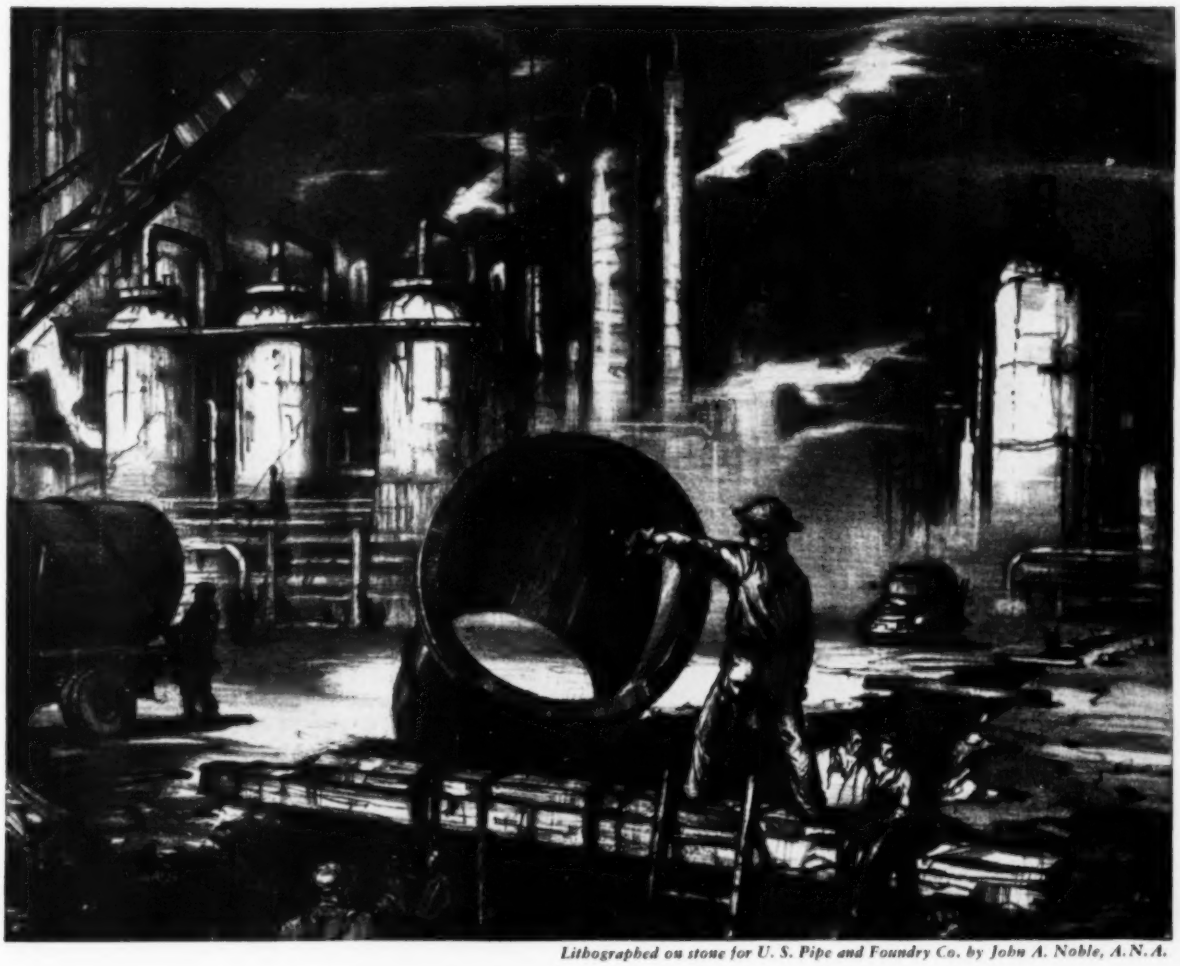
E-81



Lithographed on stone for U. S. Pipe and Foundry Co. by John A. Noble, A.N.A.

CAST IRON PIPE—so well known for its long life and widespread use in community water, gas and sewerage systems—also has diversified uses in various industries. The volume of water, gas and waste handled by many industrial plants is often equivalent to that of a good-sized city.

U. S. cast iron pipe for community or industrial service is cast centrifugally in metal molds in sizes 2-inch to 24-inch with bell-and-spigot, mechanical joints or plain ends. All our cast iron pipe larger than 24-inch and smaller pipe with flexible or integral flange joints are made by the pit cast process. With both manufacturing processes modern control methods are employed to assure a quality product—cast iron pipe that will satisfactorily and economically meet your requirements.

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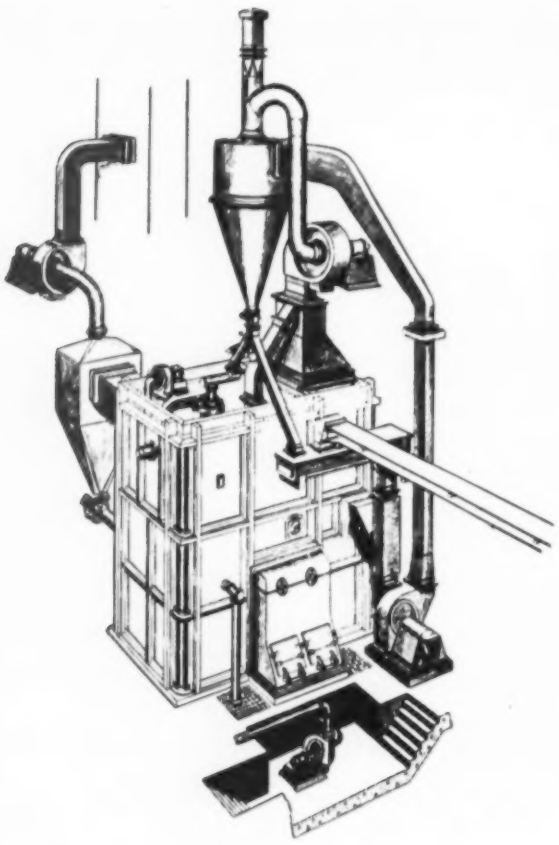
FOR WATER, GAS, SEWERAGE AND INDUSTRIAL SERVICE



The Ideal Solution to Sludge Disposal Problems

Here is the *modern method* of sludge disposal – the C-E Raymond System of Flash Drying and Incineration. Continuously, automatically, this system incinerates thickened sludge to a fine ash, free from clinker and unburned materials... or flash dries it to fertilizer, containing all of the original fertilizer constituents.

C-E systems now in service are meeting the requirements of both large and small communities – serving equivalent populations from 6,000 to 3,600,000. The list below shows the most recent installations.

C-E Raymond Systems installed, under construction or on order since 1945

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Bethlehem, Pa.	Morris Knowles
Bloomsburg, Pa.	Gannet, Fleming, Corddry & Capper
Camden, N. J.	Havens & Emerson
Chicago, Ill. (W. Southwest)	City Engineering Dept.
Fond du Lac, Wis.	Jerry Donohue Engrg. Co.
Houston, Texas	Greeley and Hansen
Lansing, Mich.	Drury, McNamee and Porter
Los Angeles, Cal.	Metcalf and Eddy
San Diego, Cal.	Frank Currie
San Francisco, Cal.	Clyde C. Kennedy
Schenectady, N. Y.	Havens and Emerson
Sheboygan, Wis.	Jerry Donohue Engrg. Co.
Washington, D. C.	Greeley and Hansen
Waterbury, Conn.	Malcolm Pirnie
Wyomissing Valley, Pa.	Albright & Friel
York, Pa.	Albright & Friel

C-E Raymond Systems are flexible in layout, highly efficient and fully reliable; they provide for maximum utilization of waste heat. They mean for any community the end of stream or atmospheric pollution resulting from the disposal of sewage wastes.

The services of C-E specialists are available to help you plan for the most practical and economical answer to your sludge disposal problems. For prompt attention, get in touch with one of the Combustion offices listed below.

Industrial sludges a problem?
C-E Raymond Flash Drying and Incineration Systems have been the answer for others. Write for information.

B-586

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Chicago 22, Illinois

Western Office: 560 W. Sixth, Los Angeles 14, Calif.
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The First Meter to be fully

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In all other meter designs the interior parts are bolted together and, in some, the interior assembly is directly attached to the meter casing at the stuffing box.

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. . . *and the* EMPIRE TYPE 14

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Los Angeles New York Pittsburgh San Francisco Seattle Tulsa

Installation: Collierville, Tenn. 40,000 feet, 6-inch, Class 150 "Century" asbestos-cement pressure pipe. Construction Engineers: Allen & Hoshall. Contractor: R. L. Bernado & Son. Both firms of Memphis, Tenn.

FOR the project pictured here, the authorities of Collierville, Tennessee, selected "Century" pipe because of the same good reasons that have decided so many other communities.

The pattern of decision often goes like this: the authorities concerned investigate suitable kinds of pipe. They quickly note that "Century" asbestos-cement pressure pipe is economical to buy. And, because it is light in weight and easy to handle, its installation is quick and low in cost.

With an eye to the future, they approvingly note that "Century" pipe never tuberculates, has high resistance to soil corrosion, and actually grows stronger as the years go by!

You can see why these low-cost, long-life features appeal to thrifty citizens! There are other important features, of course, and before *you* select pipe for water mains, it will pay you to thoroughly investigate "Century" asbestos-cement pressure pipe.

FREE BOOKLET, "Mains Without Maintenance," is yours for the asking. Contains data of value to anyone concerned with pipe for water mains. Write for your copy today.

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The C-C hand-operated or C-1 power-operated machine may be used for both drilling the main and inserting the valve plug. The C-1 machine may be operated either by the H-600 Air Motor or the new H-602 Gasoline Engine Drive Unit.

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An assembly of pressure confining units plus a slide valve. Permits the drilling of the main and inserting of the valve plug, easily and safely, with no water loss.

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Write for Catalog H-20 and H-602. Complete illustrated instruction manuals and parts list shipped with equipment.

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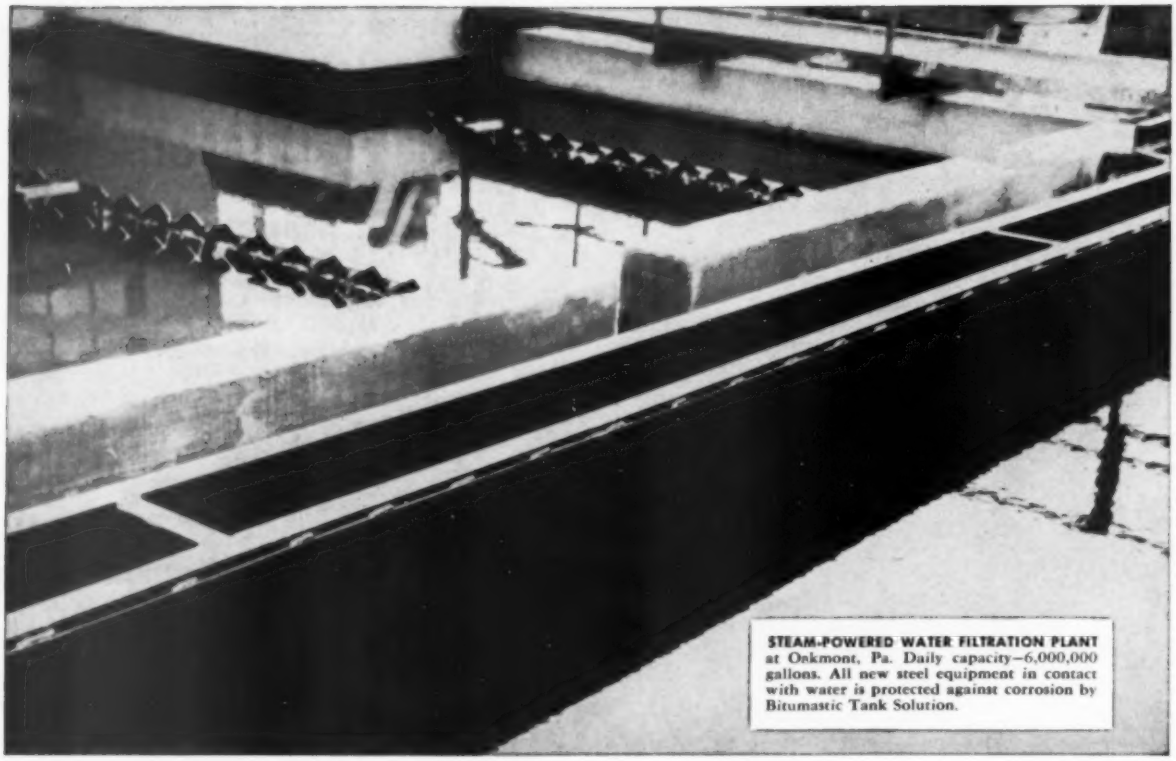

STEAM-POWERED WATER FILTRATION PLANT at Oakmont, Pa. Daily capacity—6,000,000 gallons. All new steel equipment in contact with water is protected against corrosion by Bitumastic Tank Solution.

. . . doesn't impart taste or odor to water!

SHOWN here is part of the water filtration plant of the Borough of Oakmont, Pa. Recently, daily capacity was stepped up from 3,000,000 to 6,000,000 gallons. All of the new steel equipment that comes in contact with water has been protected against corrosion by two coats of Bitumastic® Tank Solution —a protective coating that is specially formulated to avoid imparting taste or odor to water.

Bitumastic Tank Solution is widely used to protect water-supply equipment. Prepared from a tar-pitch base, this cold-applied coating keeps water away from direct contact with metal surfaces, thus preventing corrosion. Bitumastic Tank Solution is easily applied by brush or spray. It dries quickly with a glossy black finish. No flushing is needed other than that commonly used before putting any new water system into operation.

SEND FOR FREE LITERATURE!

Literature describing the entire family of Bitumastic Protective Coatings is available on request. It will help you select the right protective coating to prevent corrosion or deterioration. Shows how you can protect all kinds of filtration-plant equipment, metal or concrete. Also available is a free booklet on sewage-plant protection. Write us today.

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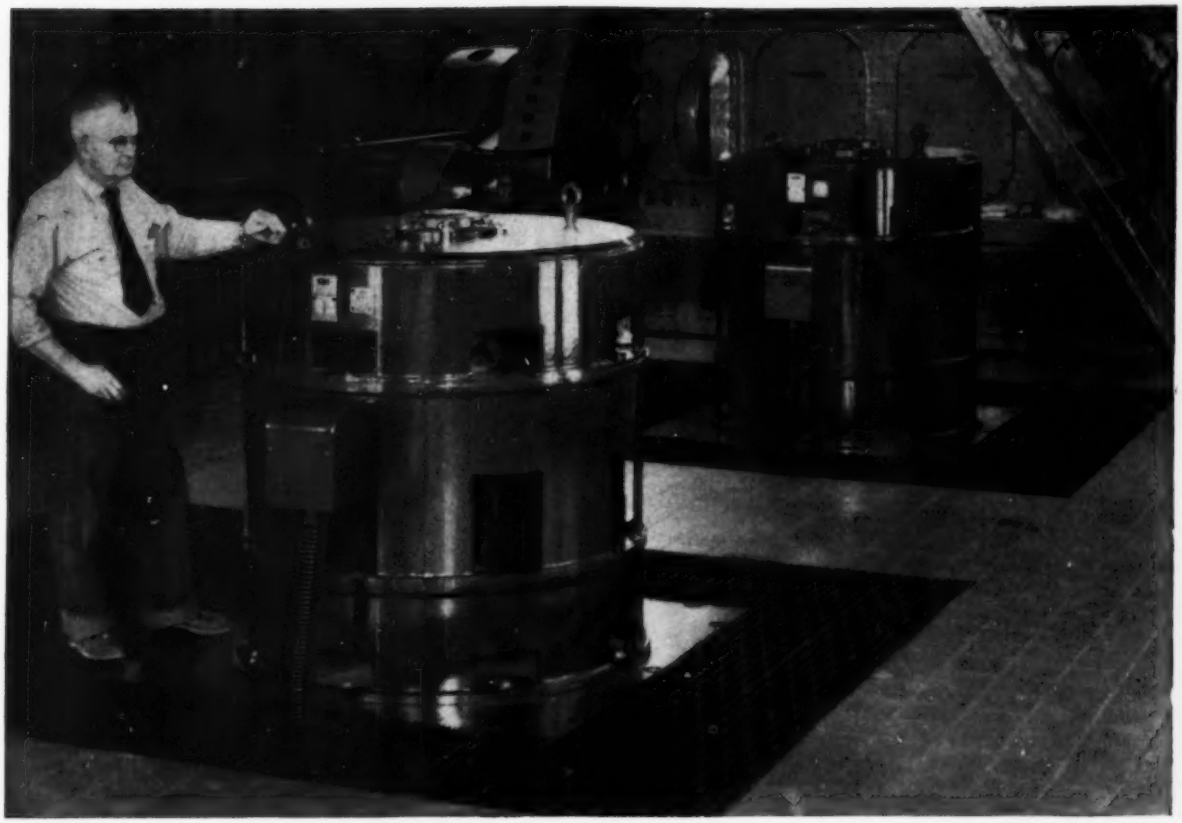

10 AND 11 FOR FLINT

Twenty-five years ago, the city of Flint, Michigan, purchased the original motors for its Third Avenue Sewage Pumping Station from E-M.

In 1948, the city bought six additional motors from E-M, totaling over 2,500 hp.

This year, Flint installed two more E-M motors — the 400 hp, 585 rpm vertical induction motors shown above to drive sewage pumps.

These repeat orders for eleven motors, based on years of experience with the product, are the most convincing proof we know of the reliability and economical operation of E-M motors. A customer has to be thoroughly pleased to place his *third* order!

Flint's new E-M motors offer premium efficiencies and reliability for tough, round-the-clock drives. They're protected against moisture and corrosive fumes by special insulation. And their simple, rugged construction is easy to adapt to vertical drives.

When you need power for the biggest, toughest pumping jobs, you can rely on E-M induction and synchronous motors . . . because they're specially designed for your particular needs, by E-M specialists in big motor engineering.

Call your nearest E-M field engineer for his suggestions on your specific requirements, and write to the factory for Pump Bulletin No. 33.

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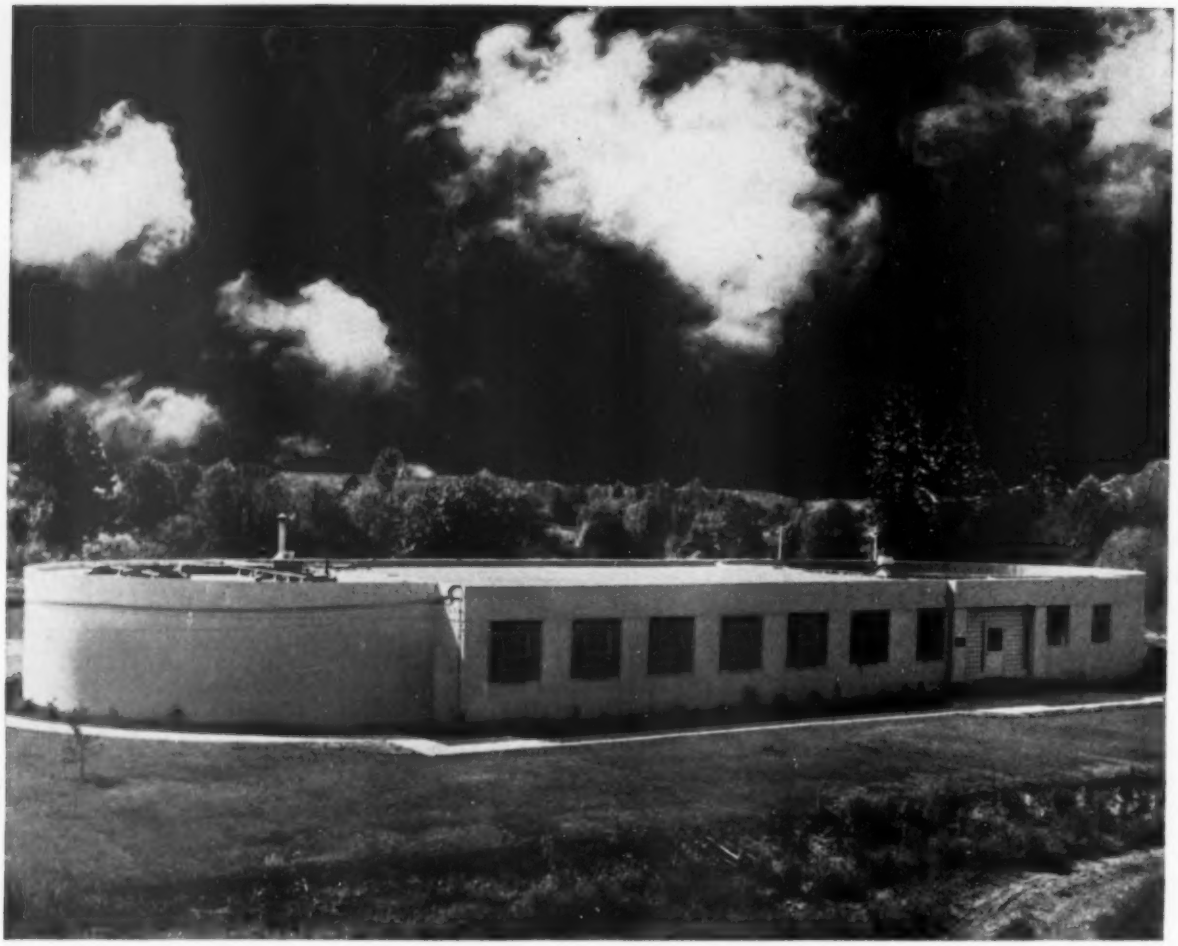
SPECIALISTS IN *Big Motor* ENGINEERING

E-M



Build Functional and Distinctive Sewage Treatment Plants with Architectural Concrete

This sewage treatment plant in Centralia, Wash. exemplifies how architectural concrete combines functional qualities with distinctive appearance.

Centralia has a combined sanitary and storm sewer system. During the rainy season the sewage is given primary treatment only.

As a primary plant its capacity is 4½ m.g.d. and as a complete treatment plant 2 m.g.d.

Designers and engineers: Carey & Kramer, Seattle. Builder: A. G. Homann Co., Olympia.

Architectural concrete is an ideal construction material for sewage treatment plants. Its clean, neat appearance is a symbol of cleanliness and good municipal housekeeping. It makes the building a long-lasting asset and a source of community pride. It also offers:

1 UNUSUAL DURABILITY. It resists such destructive agents as severe weathering, fire, decay and sewage gases.

2 GREAT STRENGTH. It can be designed economically to withstand all vertical and horizontal forces.

3 REAL ECONOMY. Moderate first cost, low maintenance cost, long life = ***low annual cost.***

Investigate the advantages of architectural concrete for sewage treatment plants. Write for free literature, distributed only in U. S. and Canada.

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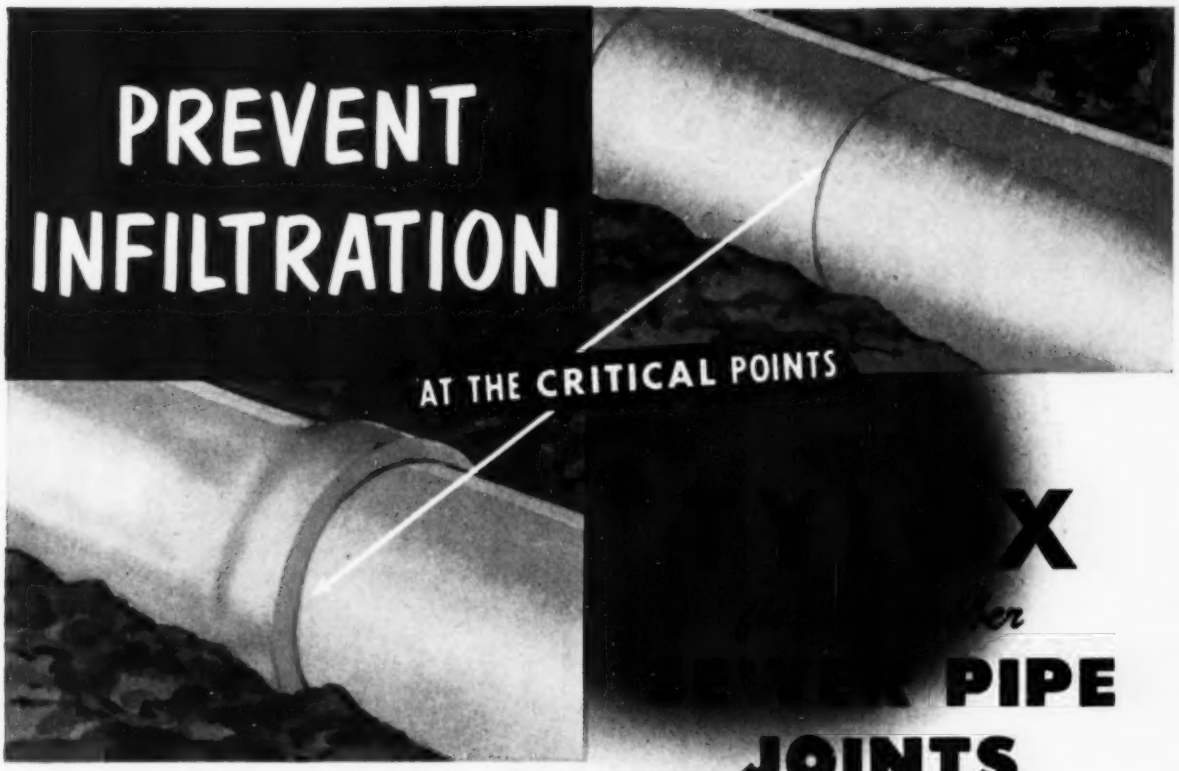
A national organization to improve and extend the uses of portland cement and concrete through scientific research and engineering field work



Per mile coefficients of infiltrated ground water are *"scarcely worth measuring"*, in sewer and drain lines equipped with TYLOX flexible rubber joints.

Statements like this come to us regularly from engineers and contractors handling big TYLOX-jointed pipe jobs.

For *less* infiltration than the average specification allows, is *normal* performance for TYLOX-jointed lines, and engineers of some projects — Oklahoma City's 25 miles of new main and trunk sewers, for example — have reported up to *90% less infiltration* than design permissibles.

And TYLOX is known for its ageless qualities . . . for its ability to make sewerage and drainage pipe joints "leakproof for life."

If the sewerage and drainage systems you are planning call for tongue-and-groove, or bell-and-spigot pipe, you, too, can practically *prevent* infiltration at the joints by specifying TYLOX *flexible* rubber pipe-jointing gaskets. Use of TYLOX pipe joints assures *least* infiltrated ground water, thus increasing the performance of sewage treatment plants, while reducing their maintenance and operating costs. And the many TYLOX features that cut installation costs, encourage construction bids more favorable to budget-wise municipal sewerage and drainage planning.

Write today for complete specification data and literature on TYLOX pipe jointing Gaskets.

Making Joints with TYLOX RUBBER GASKETS is as simple as A B C

Cement tongue and snap on TYLOX gasket.

Lubricate sliding surfaces with TYLOX cement.

Shove the pipe home to line and grade.

1763

HAMILTON KENT

the most efficient pipe ever made for water mains

modernized

Cast iron pressure pipe—centrifugally cast and centrifugally cement-lined—with bell-and-spigot or mechanical joints—is not only the most efficient but the most advanced pipe made for water distribution.

The centrifugal casting process—the most modern of all methods of producing cast iron pressure pipe—has been adopted by all members of the Cast Iron Pipe Research Association.

* * *

The same basic metal which has proved its ability to function for more than a century in water supply and distribution mains is still used. By research in metallurgy and the centrifugal casting process, cast iron pipe has been modernized and made tougher, stronger and more uniform in quality.

CAST IRON ®

Modernized

cast iron

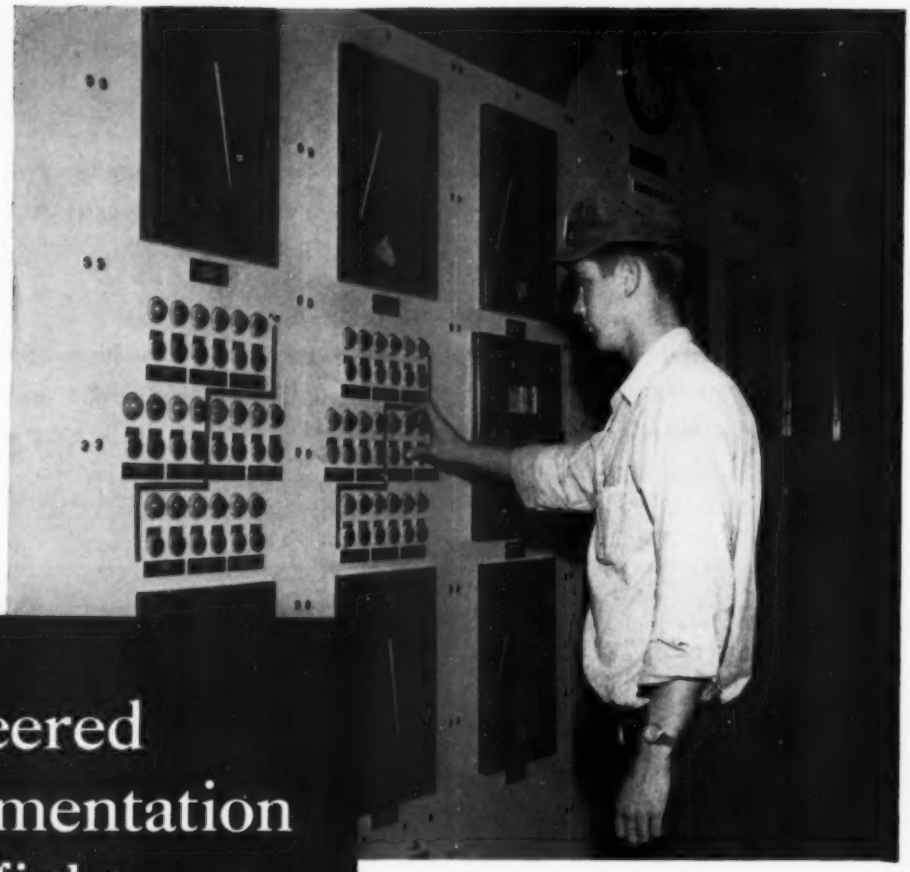
Cast iron pipe is available with *cement mortar lining centrifugally applied.* This is *modernized* cast iron pipe—with *sustained carrying capacity* for the life of the pipe. Since it is tuberculation-proof it has greatly reduced friction-loss with resultant reduction in pumping costs.

If you want pipe at its finest—at its highest efficiency and offering its maximum economy—your new mains will be laid with centrifugally-cast, centrifugally-lined, cast iron pipe. Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, 122 So. Michigan Ave., Chicago 3.

cast iron pipe-

centrifugally cast with centrifugally applied cement lining pipe

for Modern Waterworks Operation



engineered instrumentation helps fight water pollution

Battery of digesters is efficiently controlled from this panel of Honeywell instruments, at the Hyperion plant, Los Angeles. Combustible gas from the digesters is used as fuel for the internal combustion power plant.

THE city of Los Angeles called on the most advanced engineering techniques to solve their big waste-disposal problem. The result: the Hyperion Activated Sludge Plant, which daily processes 350 million gallons of sewage into clear water that can be discharged into the ocean without danger of contamination.

Honeywell control instrumentation, although it amounts to only a minor percentage of total plant cost, makes invaluable contributions to the smooth, efficient operation of this plant, from automatic operation of bar screen rakes to control of gas firing of sludge driers.

Honeywell's engineering service, representing many years of experience in this specific field, is ready to design custom-fitted instrumentation for your water or waste-treatment plant. The broadest line of measuring and controlling systems —for filtration, aeration, drying, flotation and related processes—is at your disposal.

Our local engineering representative is well qualified to discuss your requirements with you and your consulting engineer. Call him today . . . he is as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4575 Wayne Ave., Philadelphia 44, Pa.

● REFERENCE DATA: Write for reprint of article, "$42 Million Sewage Plant Pays Much of Own Way"

MINNEAPOLIS **Honeywell**

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First in Controls

Dependability in Power

U.S. VERTICLOSED MOTOR

STREAMWAY DESIGN FOR HIGHEST EFFICIENCY IN DEEP WELL PUMPING

Progressively improved for 44 years

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Forever Dependable

ASBESTOS-PROTECTED WINDINGS

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US MOTORS

U. S. Electrical Motors Inc.
Los Angeles 54, Calif. (Box 2058) Milford, Conn.
Send your 16-page Bulletin featuring
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An Investment in Future Economy

Development of dependable power for deep well turbine pumps is notably reflected in the advanced U.S. Verticlosed Motor. Designed exclusively for pumps, this U.S. motor incorporates many exclusive features to insure high efficiency and prolonged life. Mail Coupon for 16-page descriptive Bulletin.

U. S. ELECTRICAL MOTORS Inc. Los Angeles 54, Calif. Milford, Conn.

U. S. VERTICLOSED MOTOR

Base of New WATERSPHERE Serves as Pump House

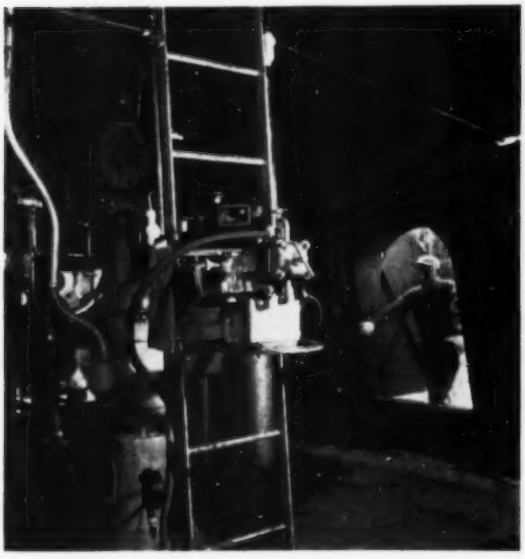
In 1951, a 50,000-gal. Horton Watersphere was installed at Aroma Park, Ill., to help provide the village with a dependable gravity pressure water supply for domestic needs, commercial use and fire protection. In addition to the usual benefits, the base of the Watersphere is used to house Aroma Park's water treating and pumping equipment. This arrangement eliminates the cost of building and maintaining a separate pump house.

Horton Waterspheres combine sound engineering principles with modern design. Their pleasing symmetry has become a symbol of progress, utility and good water service for private as well as municipal water systems.

Waterspheres, like the Aroma Park installation, are built in standard capacities from 25,000 to 250,000 gallons. Where larger capacities are needed, Horton elevated tanks are built with ellipsoidal bottoms in standard capacities from 15,000 to 500,000 gallons—with radial-cone bottoms from 500,000 to 3,000,000 gallons.

For estimates or quotations, please write our nearest office. State capacity desired, location and height to bottom. There is no obligation on your part.

50,000-gal. Horton Watersphere helping to provide the village of Aroma Park, Ill., with an economical, dependable gravity pressure water supply. Warren & Van Praag, Inc., Consulting Engineers of Decatur, Ill., designed the Aroma Park water system.



Interior view of the Watersphere's base which houses an electrically-driven pump, treating equipment, chlorination facilities and control panel.

HORTON
WELDED STEEL
STORAGE TANKS

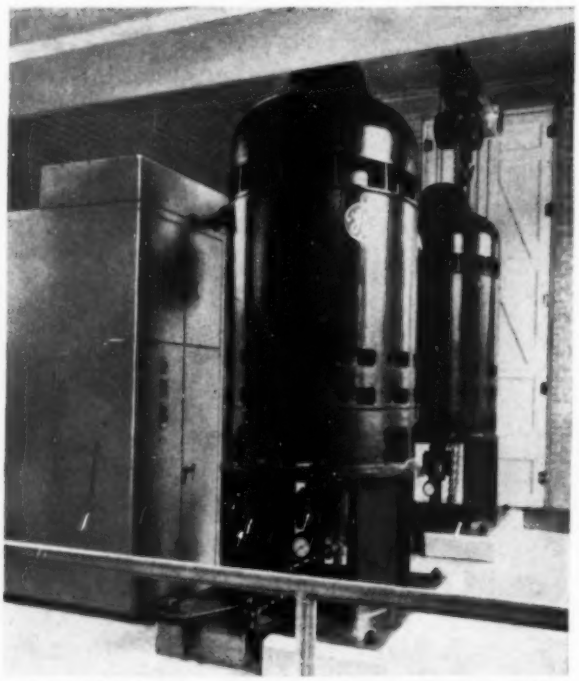
CHICAGO BRIDGE & IRON COMPANY
Plants in Birmingham, Chicago, Salt Lake City, and Greenville, Pa.

Atlanta 3	2181 Healey Bldg.	Houston 2	2115 C. & I. Life Bldg.
Birmingham 1	1586 North Fiftieth St.	Los Angeles 17	1555 General Petroleum Bldg.
Boston 10	1048—201 Devonshire St.	New York 6	3390—165 Broadway Bldg.
Chicago 4	2198 McCormick Bldg.	Philadelphia 3	1644—1700 Walnut Street Bldg.
Cleveland 15	2262 Midland Bldg.	San Francisco 4	1583—200 Bush St.
Detroit 26	1551 Lafayette Bldg.	Seattle 1	1530 Henry Bldg.
Havana	402 Abreu Bldg.	Tulsa 3	1646 Hunt Bldg.

1 SUBURBAN PHILADELPHIA. Here, in modernizing and expanding the Crum Creek Pumping Station, steam equipment was replaced with G-E motors and power-distribution equipment. As a result, output was increased by 5 mgd, operating efficiency improved by 20 per cent. Photo shows two G-E motors, rated 900 hp and 200 hp driving 15-mgd and 3-mgd DeLaval pumps. Latter is one of two. Motors are controlled from G-E metal-clad switchgear in rear.

Three cities act now for

3 WINSTON-SALEM, N. C. Recent expansion has increased pumping capacity at High Service Station by 12 mgd. Shown are two of seven G-E motors, protected by G-E Limitamp control, which account for new 29½-mgd capacity.



At the Yadkin River Pumping Station, these G-E 600-hp vertical motors, controlled by G-E Limitamp panels, drive 4-mgd Worthington pumps. Consultants were J. D. Spinks of Winston-Salem and Albright & Friel of Philadelphia.

2 LA GRANGE, GA. This new water-treatment plant has a 4-mgd capacity. Only 68 per cent loaded, it will meet the city's needs till 1960. Plant and pump house operations are controlled by one man from this G-E Cabinetrol* control unit.

Incoming power for plant is stepped down by three G-E 150-kva transformers. G-E engineers worked closely with Wiedeman & Singleton, consultants, J. H. Small & Co., contractors, and White Electrical Constr. Co., electrical contractors.

more water tomorrow

Install new G-E equipment to boost efficiency, meet present and future needs for greater capacity

These three cities—suburban Philadelphia, La Grange, Ga., and Winston-Salem, N.C.—are typical of many others throughout the nation that realize action is needed, and needed now, to prevent serious water-supply problems in the future.

In each case, whether it involved an entirely new installation or a modernization and expansion program, their objective was the same—to provide efficient increased capacity for today and tomorrow, to match the needs of a growing population, greater per-capita water consumption, and industrial expansion.

In each case, too, General Electric equipment was chosen for the electrical system, and G-E engineers offered valuable assistance on electrical system planning to municipal engineers and their consultants.

*Registered Trade-mark of General Electric Company.

This same kind of help can pay off for *your community's* water-supply program, too. G-E application engineers are ready to work closely with your engineers or consultants in developing a co-ordinated electrical system to meet your community's requirements. For best results, call in your G-E Apparatus Sales representative early in the planning stage.

MAKE YOUR COMMUNITY WATER-SUPPLY CONSCIOUS

Dramatize the need for an adequate water supply by showing the new color movie "Pipeline to the Clouds." It's part of G.E.'s *More Power to America* Water Supply Program. Contact your local G-E Apparatus Sales Office or write on your letterhead for Bulletin GEA-5555 to General Electric Co., Section 666-74, Schenectady 5, N. Y.

Engineered Electrical Systems for Waterworks

GENERAL ELECTRIC

there's
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Threshold Treatment
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THINGS ARE WHAT THEY SEEM

when we're talking about Threshold Treatment with Calgon. This simple, economical and effective treatment has solved many of the toughest problems encountered with municipal and industrial waters.

And here's why . . . Threshold Treatment with Calgon does the following:

- **CONTROLS CORROSION**
- **PREVENTS LIME SCALE**
- **STABILIZES DISSOLVED IRON AND MANGANESE**
- **STABILIZES WATER FOLLOWING SOFTENING**

Tell us about your problems so that we may show you just what Calgon can do for you.

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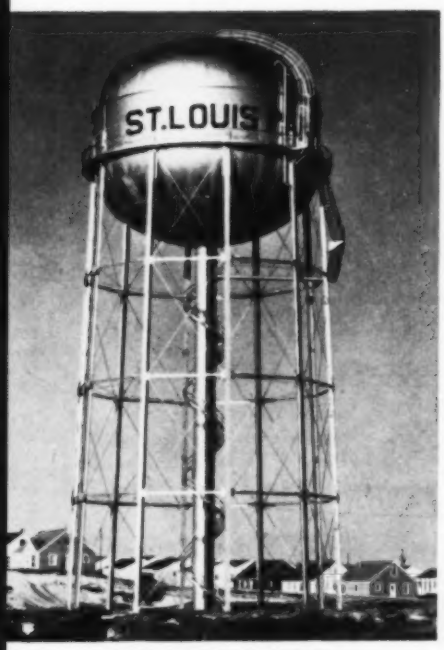
PITTSBURGH-DES MOINES

DOUBLE-ELLIPSOIDAL

Elevated Steel Tanks



ST. LOUIS PARK, MINNESOTA
Diameter 65 ft.
Head range 48 ft. 5 ins.
H-column tower, 106 ft.

SANDUSKY, OHIO
Diameter 68 ft.
Head range 42 ft.
H-column tower, 81 ft.

AMARILLO, TEXAS
Diameter 68 ft.
Head range 42 ft.
Tubular column tower, 114 ft.

Write for this well-illustrated, comprehensive Catalog of the complete range of P-DM Elevated Steel Tanks, without obligation.

The intrinsic design economy of our famous Double Ellipsoidal Elevated Steel Tank makes this type particularly attractive where low cost with good appearance is a major consideration. Clean cut lines without ornamentation enable savings in construction that are reflected in the purchase price. Fine, simple proportions result in a handsome structure for the community. Let us give you the details on our Double Ellipsoidal and other elevated tank types in a personal meeting, at your convenience.

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1st Lieutenant Lloyd L. Burke
U.S. Army
Medal of Honor

THE RED KOREAN strongpoint had stalled our attack; Lieutenant Burke saw that a breakthrough must be made. Rallying 35 men, he crept close to the enemy bunkers. He laid down a grenade barrage. Then he ran forward to an

exposed knoll and opened a one-man pitched battle. He turned a light machine gun into the Red position. He caught live enemy grenades in mid-air and threw them back. Once he killed three men with his pistol. Before sunset Lieutenant Burke and 35 men had defeated 300. The lieutenant says:

"Every day, men who fought in Korea are coming home. They're finding jobs—partly because they and you and I own nearly 50 billion dollars' worth of Defense Bonds. For Bond savings—which protect our own families—are also building a great backlog of *national* prosperity. Reason enough for investing in Bonds—don't you agree?"

* * *

Now E Bonds earn more! 1) All Series E Bonds bought after May 1, 1952 average 3% interest, compounded semiannually! Interest now starts after 6 months and is higher in the early years. 2) *All maturing E Bonds* automatically go on earning *after maturity*—and at the new higher interest! Today, start investing in better-paying Series E Bonds through the Payroll Savings Plan.

Peace is for the strong! For peace and prosperity save with U.S. Defense Bonds!

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JEFFREY "goes to town"...

... in the hills of Pennsylvania

Altoona, Pa., as hundreds of other municipalities in the nation, called on Jeffrey for the most modern engineered equipment for treating sewage. The above illustrations show a part of a coordinated sewage system that Jeffrey engineers designed specifically for Altoona.

City engineers prefer Jeffrey equipment. They like the way Jeffrey engineers help them develop *methods* for *results*.

Whether the problem is water, sewage or industrial wastes, rely on Jeffrey experience and engineered equipment. Write Sanitation Division for Catalog No. 833 today.

SANITATION EQUIPMENT

Sludge Collectors • Sludge Elevators • Grit Washers • Grit Collectors • Scum Removers • Spiral Conveyors • Screenings Grinders • Garbage Grinders • FLOCTROLS • Rapid Mixers • Bucket Elevators • Chains, Sprockets

THE JEFFREY MANUFACTURING CO.

ESTABLISHED 1877

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PLANTS IN CANADA, ENGLAND, SOUTH AFRICA

IF IT'S MINED, PROCESSED OR MOVED ...IT'S A JOB FOR JEFFREY!

The difference between Life... and Death...

"Why should you give blood? Ask me—I ought to know. I fought in Korea. But since then I've been through the biggest battle of all—the battle for life itself. And it was blood—and blood alone—that saved me. Don't know when I'll be in a position to start repaying my debt by giving some blood of my own. But I will—some day. You can count on it!"

All kinds of people give blood—for all kinds of reasons. But every reason for giving blood is a *special* reason . . . just as every American life that can be saved at any time and at any place . . . is special. So whatever *your* reason for giving blood, this you can be sure of: Whether it goes to a combat area, a local hospital, or for Civil Defense needs—this priceless, painless gift will some day save an American life!

Business Executives!
✓Check These Questions!

If you can answer "yes" to most of them, you—and your company—are doing a needed job for the National Blood Program.

- ☐ Have you given your employees time off to make blood donations?
- ☐ Has your company given any recognition to donors?
- ☐ Do you have a Blood Donor Honor Roll in your company?
- ☐ Have you arranged to have a Bloodmobile make regular visits?
- ☐ Has your management endorsed the local Blood Donor Program?
- ☐ Have you informed employees of your company's plan of co-operation?
- ☐ Was this information given through Plant Bulletin or House Magazine?
- ☐ Have you conducted a Donor Pledge Campaign in your company?
- ☐ Have you set up a list of volunteers so that efficient plans can be made for scheduling donors?

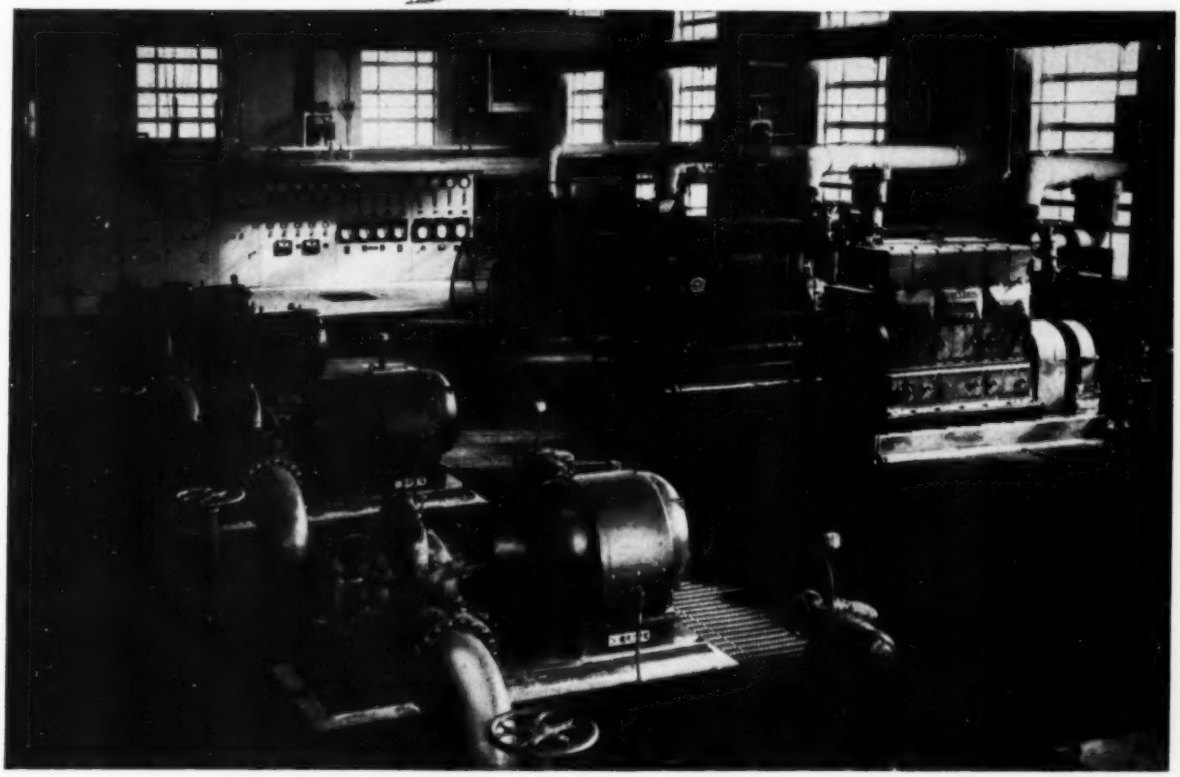
Remember, as long as a *single* pint of blood may mean the difference between life and death for *any* American . . . the need for blood is *urgent!*

Give Blood Now

CALL YOUR RED CROSS TODAY!

NATIONAL BLOOD PROGRAM

DE LAVAL FIRE PUMPS *on the job at Idlewild*



Ten De Laval centrifugal pumps, with a total capacity of 34,000 gpm, play a vital role in the deluge fire-fighting system of the New York International Airport at Idlewild, Long Island.

The installation is composed of two 2,500 gpm and three 4,000 gpm motor-driven pumps as well as two 2,500 gpm and three 4,000 gpm diesel-driven units, which are used for standby service. When the normal operating pressure drops from 165 psi to 140 psi or less, the electric pumps go to work automatically. The diesels are brought into service as necessary.

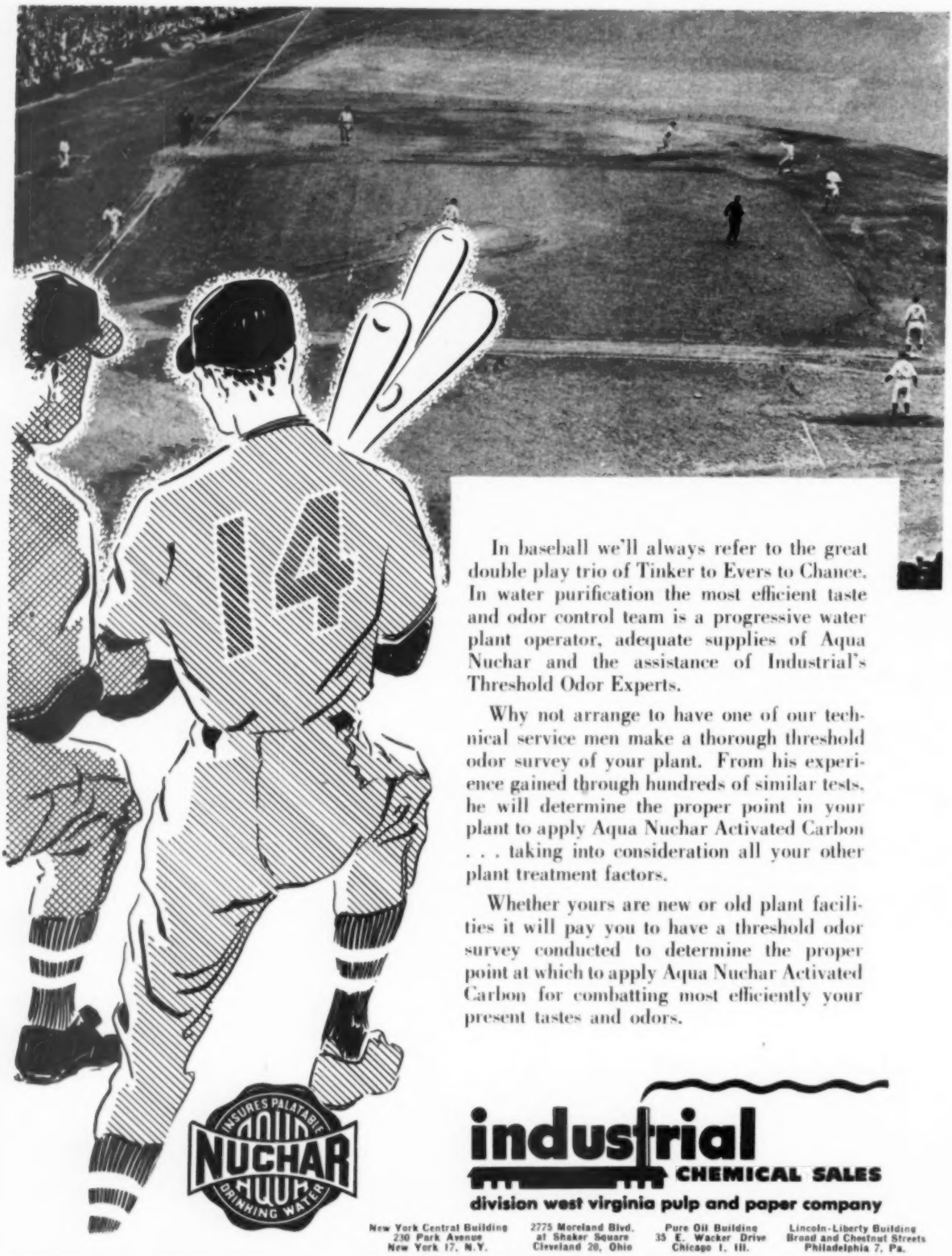
Efficient De Laval centrifugal pumps are serving water works and fire-fighting stations all over America. These pumps are available in capacities ranging from less than one million gallons per day to more than 100 million gallons per day.

DE LAVAL *Centrifugal Pumps*

DE LAVAL STEAM TURBINE COMPANY
824 Nottingham Way, Trenton 2, New Jersey

DL 177

Teamwork *makes the difference . . .*



In baseball we'll always refer to the great double play trio of Tinker to Evers to Chance. In water purification the most efficient taste and odor control team is a progressive water plant operator, adequate supplies of Aqua Nuchar and the assistance of Industrial's Threshold Odor Experts.

Why not arrange to have one of our technical service men make a thorough threshold odor survey of your plant. From his experience gained through hundreds of similar tests, he will determine the proper point in your plant to apply Aqua Nuchar Activated Carbon . . . taking into consideration all your other plant treatment factors.

Whether yours are new or old plant facilities it will pay you to have a threshold odor survey conducted to determine the proper point at which to apply Aqua Nuchar Activated Carbon for combatting most efficiently your present tastes and odors.

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LAYNE WATER WELLS

. . . are part of BELL AIRCRAFT'S amazing growth

If you are interested in a water well installation, please write for more information about Layne services.

One of America's most interesting sagas of industry, is the amazing growth of Bell Aircraft Corporation's Helicopter Division at Hurst, Texas. From this great plant Bell "eggbeaters" have gone to all parts of the world—both for war and peacetime service.

When Bell Aircraft selected a site for their big Texas plant, they immediately ordered the installation of a complete Layne Water Supply System. Today that single Layne installation is more than fulfilling all water supply needs for both manufacturing and employees—and apparently can continue to do so for many years to come. Layne is happy to name Bell Aircraft Corporation as another in a long list of important industrial organizations that own Layne Water Wells and Pumps.

LAYNE & BOWLER, INC.
General Offices, Memphis 8, Tenn.

Layne

Without obligation Layne will be glad to provide a complete file of late catalogs and literature on modern water supply wells and high efficiency vertical turbine pumps.

WATER WELLS
VERTICAL TURBINE PUMPS
WATER TREATMENT

Information courtesy Mr. E. H. Aldrich, Chief Engineer, American Water Works Service Co., Phila., Pa.

There are four purification units like this at Chattanooga with a rated capacity of 2.5 mgd each, capable of operating at twice this capacity. These are an addition to the existing plant of 32 mgd capacity.

Two years ago, this entirely new design developed by American Water Works Service Company was installed in Alexandria, Va. Instead of the conventional layout, with separate structures for mixing, settling, etc., this plant has *"purification units."* Each unit incorporates all the major purification operations . . . i.e. after the raw water is chemically treated, it receives the usual mixing, coagulating, settling, and filtering, all in the same steel tank (see drawing).

The success of the plant has led to two new installations—Chattanooga, Tenn., and Westmoreland County, Pa. Like Alexandria, both these plants cost far less to build than comparable units of conventional design. All three plants have proved to be easy and economical to operate, and highly flexible.

The porous underdrains used in all these purification units are ALOXITE aluminum oxide plates. These should contribute materially to continued low operating and maintenance costs.

May we send you our popular booklet on porous media? It's 56 pages cover all fields of filtration and diffusion. It gives pointers on specifying materials; outlines how to install, operate and maintain various units. Complete with photos, charts, etc.

Use porous plates and diffusers by

CARBORUNDUM

Trade Mark

Dept. M-33, Refractories Division — The Carborundum Company, Perth Amboy, N. J.

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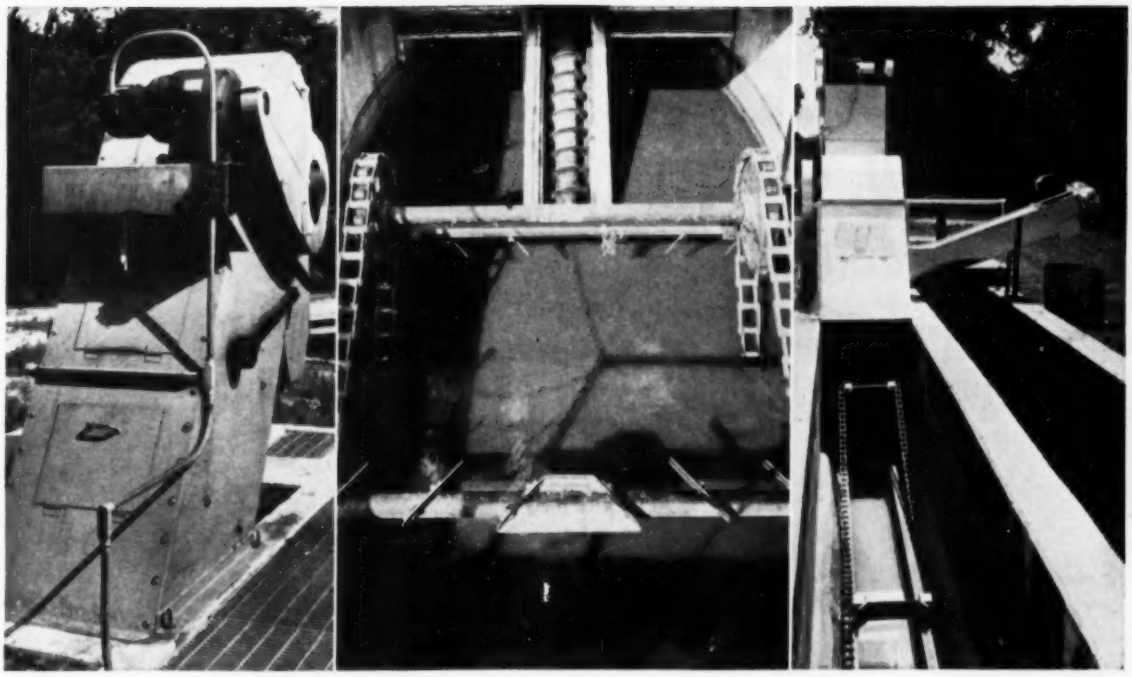

TRITOR SCREENS—At small sewage treatment plants—where grit creates a problem during storm flows, this one machine accomplishes the effective, low-cost removal of both screenings and grit.

STRAIGHTLINE GRIT CHAMBERS—For the removal of a clean, washed grit with a low putrescible content. The complete collection and thorough cleaning operation makes further handling unnecessary.

STRAIGHTLINE GRIT COLLECTORS—On this bucket type collector, water sprays wash the grit from the buckets into a separate washing and dewatering screw. Photo also shows Link-Belt Bar Screen.

How to get flexible, low-cost grit removal

LINK-BELT can give you equipment best suited to your requirements

DON'T let grit plug your pipe lines . . . wear out your pumps . . . take up valuable space in your digesters. Link-Belt builds effective grit removal equipment that assures both low costs and flexibility.

For example, with the Tritor Screen, a grinder may be used to shred the screenings when no grit is received. During storms, the grinder may be by-passed and grit and screenings disposed of by fill, burial or incineration. Similarly, the Straightline grit collector is designed either with a pitched flight collector and dewatering and washing screw discharging direct from the grit chamber—or with a bucket type collector for deep chambers.

In addition to grit handling and washing equipment, Link-Belt manufactures a complete line of equipment for water, sewage and industrial waste treatment plants. A call to the Link-Belt office near you will put you in touch with an experienced sanitary engineer. He'll work with your engineers, chemists and consultants—help you get the best in modern treatment equipment.

LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Colmar, Pa., Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle, Toronto, Springs (South Africa), Sydney (Australia). Sales Offices in Principal Cities.

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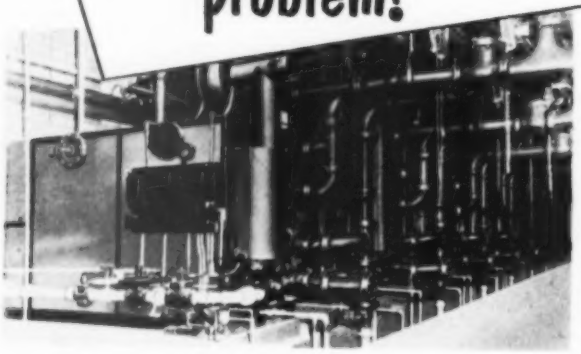
LINK-BELT

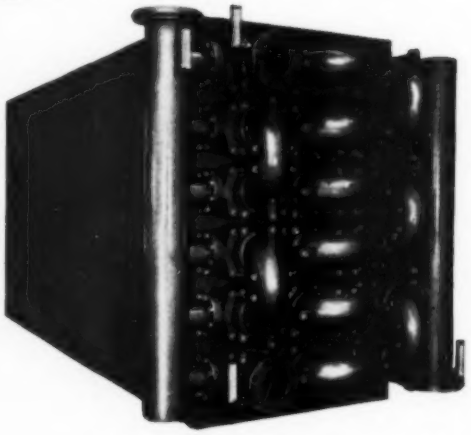
SANITARY ENGINEERING EQUIPMENT

*P.F.T. has the Answer to your digester heating problem!

HERE ARE TYPICAL SOLUTIONS TO THE PROBLEM OF DIGESTER HEATING



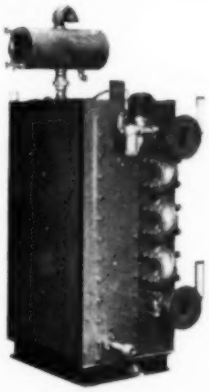
Akron, Ohio, Sewage Treatment Plant—Eight P.F.T. No. 1000 Digester Heaters and Heat Exchangers serving six digesters. 8,000,000 B.t.u./hr. combined output. Four are sludge gas fired — four gas and oil fired. Havens & Emerson, Consulting Engineers.



Hunt's Point Plant, New York City—One of four P.F.T. No. 634 Heat Exchanger units, having combined transfer rating of 14,500,000 B.t.u./hr. output. Waste heat from sewage sludge gas engines is utilized. Engineered by New York City Department of Public Works, and Greeley & Hansen, Consulting Engineers.

Northern Indiana State Hospital, Westville, Indiana—One P.F.T. No. 100 Heater and Heat Exchanger for sewage gas and oil firing. Boyd & Phelps, Consulting Engineers.

Norwich, Connecticut (Veterans Hospital) — One P.F.T. No. 100 Digester Heater utilizing steam from hospital power plant and arranged for future conversion to gas and oil firing. Argraves & Mort, Consulting Engineers.



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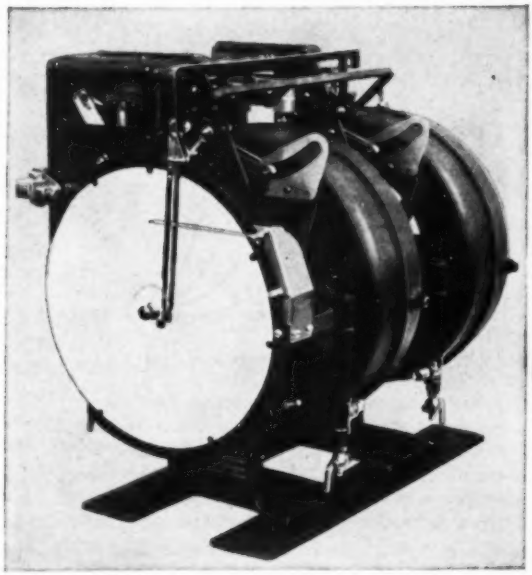

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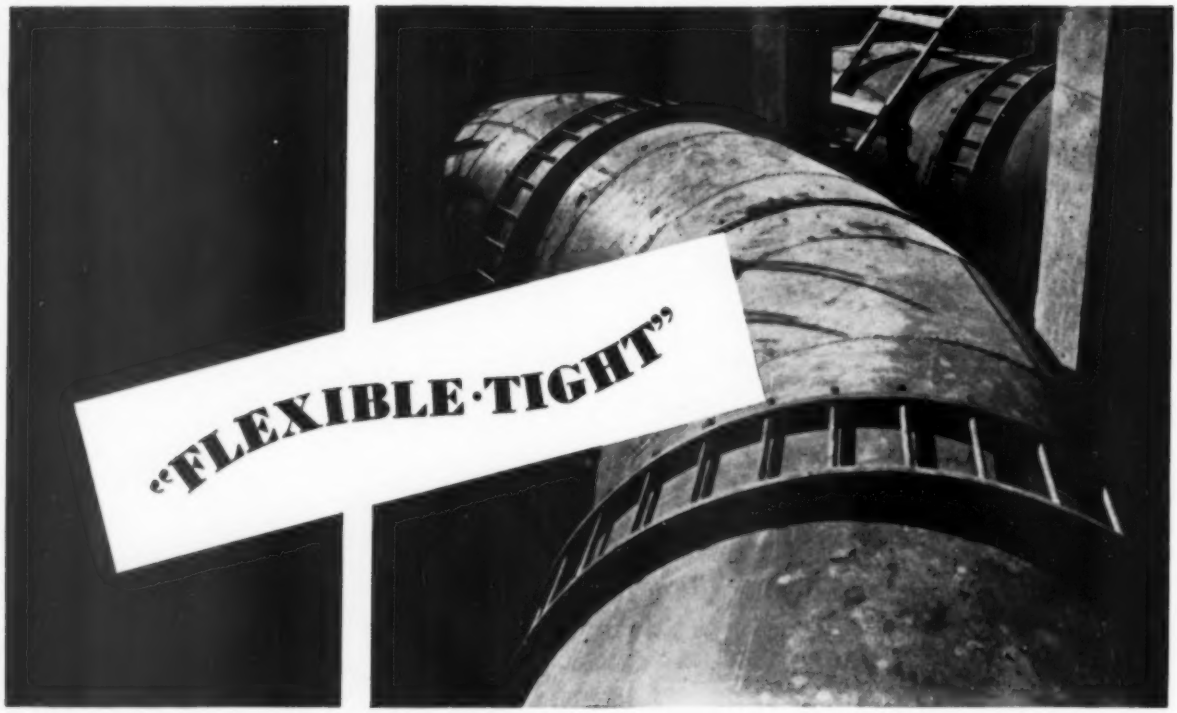

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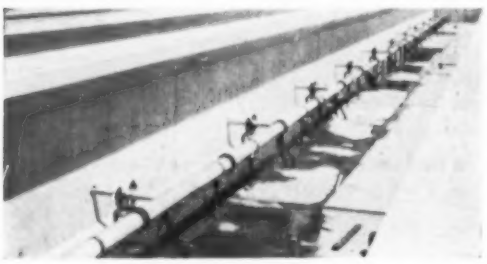

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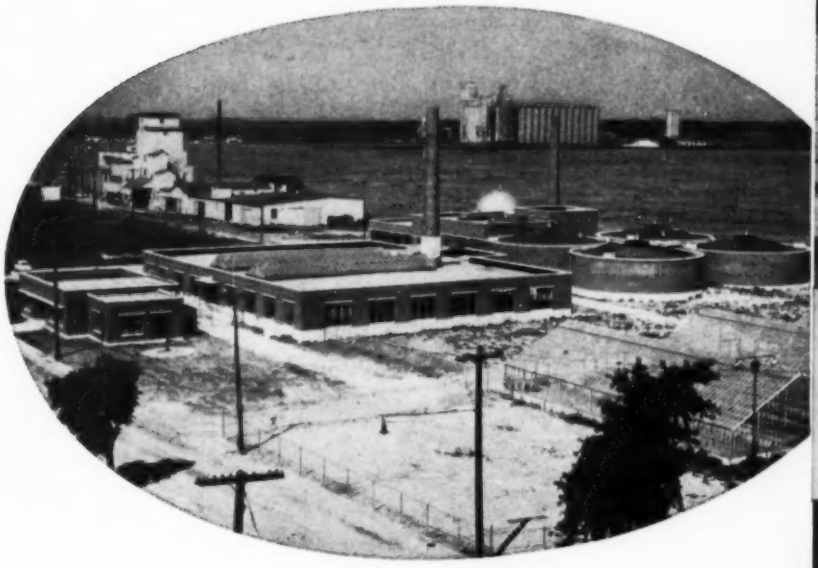
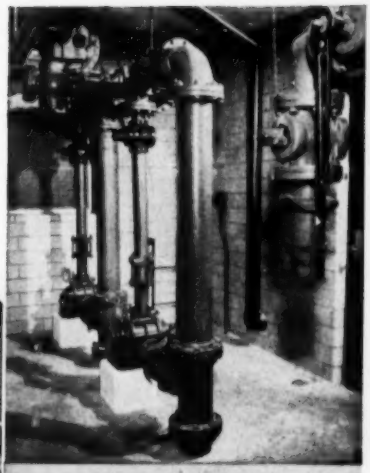
ANOTHER Sewage Treatment Plant





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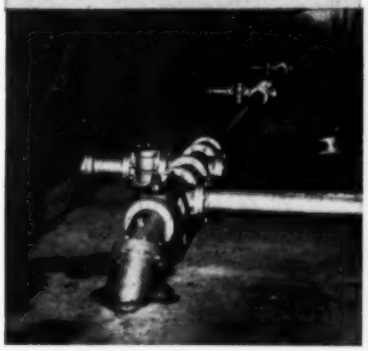

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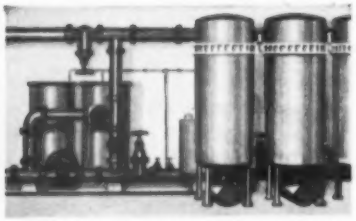

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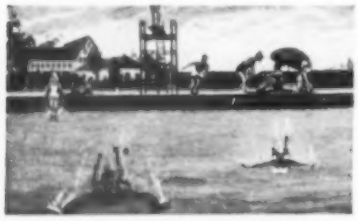

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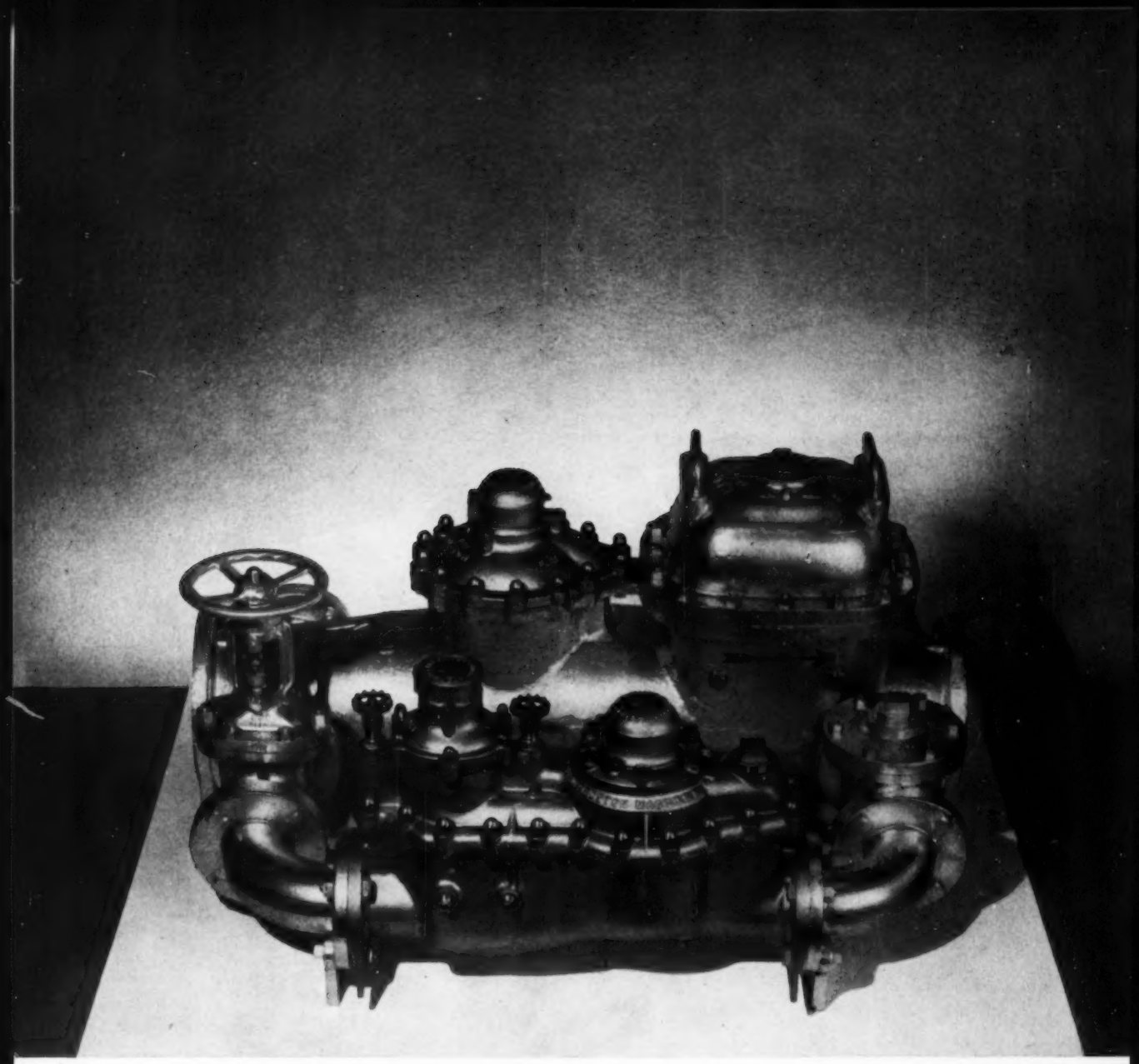

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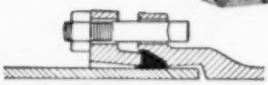

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A time-saving, easily installed mechanical joint cast iron pipe that reaches the job complete with all joint materials. Sizes 3" to 24" in 18-foot lengths.

It's always "fair weather" when you install Clow Mechanical Joint Cast Iron Pipe, Fittings and Valves. Even in a wet trench or under water, ordinary workmen can quickly do the job with ratchet wrenches. No calking needed. And once installed, this pipe line is set for a century or more of service. Each joint is sealed "bottle-tight" by a heavy molded rubber gasket—yet stays flexible to compensate for vibration, expansion or contraction. "Standardized" parts is another feature . . . glands, bolts and gaskets are completely interchangeable.

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All types offered in straight and reducing sizes for use with Clow Mechanical Joint Cast Iron Pipe.

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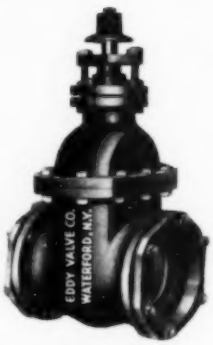

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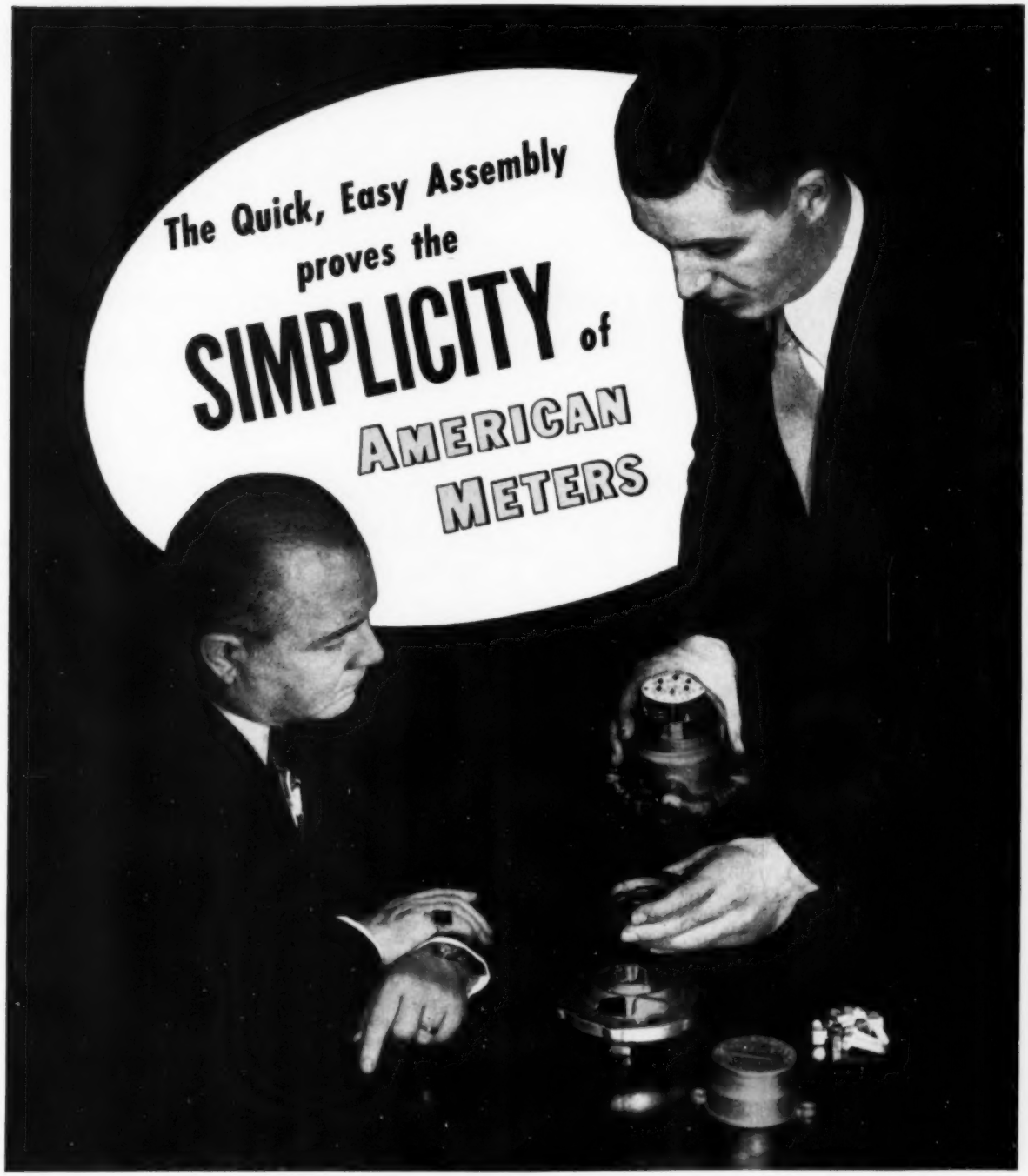

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Q. *Is HTH Tablet Hypochlorination expensive?*

A. Indeed not. The initial cost of the unit is extremely low, the operation is inexpensive, and little or no maintenance is required.

Q. *How about dependability?*

A. The HTH Tablet Hypochlorinator is designed simply yet sturdily with no moving parts. Install it and set the flowmeter . . . the Hypochlorinator will accurately treat water, sewage effluents or industrial wastes with a constant dosage of hypochlorite solutions.

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WATER & SEWAGE WORKS

VOL. 100, NO. 3 • A GILLETTE PUBLICATION • MARCH 1953

Safety in Water Works
Your Problem and Mine

The City of Akron Sets a Practical Example in Safety for Water Department Managers

by WENDELL R. LA DUE, *Chief Engr. & Superintendent, Bureau of Water & Sewerage, Akron, Ohio*

A FEW months ago the writer was called upon to secure a speaker for a service club meeting. In our community we have a Judge who is outspoken in his support of anything pertaining to safety. He gladly accepted the invitation to address the group and chose the rather cryptic subject, *"Accidents Are Not Accidents!"*. He alleged that accidents, in the main, are produced, caused, enlarged or reduced, by human elements —elements under human control and subject to human solution. The results are but the reflection of the collective behaviour of the persons involved.

For the past four years, as a member of the Committee on Programs and Services of the Conference, and as a representative of the American Water Works Association and the City of Akron, I have been privileged to attend the PRESIDENT'S CONFERENCE ON INDUSTRIAL SAFETY, held in Washington, D.C. Each year I continue to be impressed and shocked by statements to the effect that public employees, from the Federal down through all grades of government to the municipal level, represent the largest single group in the United States not subject to formal safety standards, regulations, and programs. Quite obviously, and fortunately, there are outstanding exceptions to this general statement. These exceptions, however, point out forcefully the real need of the majority for positive action.

The water works industry realizes that it is obligated to do everything within its power to prevent accidents and attendant suffering to its employees. I do not believe that this industry will long tolerate unsafe working conditions, unsafe supervision, or unsafe personnel—and all three are involved. Good planing will eliminate the physical hazards but "human engineering" alone will create the desire in people to acquire a "safe work" philosophy expressed in "safe work" habits.

The author is Chairman of the A.W.W.A. Committee on Water Works Administration, and also Chairman of the Development Committee on Water & Sewerage, Public Employee Section, National Safety Council.

Since this article was written the Council has reclassified municipal water works employees as public utility employees rather than "Public Employees."

On the Way to Solving the Accident Problem

Is anything being done about it? Are water works men being alerted? Definitely, yes, by the American Water Works Association. At the January, 1950, meeting of the Board of Directors in New York City the writer, as Chairman of the Committee on Water Works Administration, directed the Board's attention to the lack of safety programs among public employees in general and stated that this subject would receive intense committee attention during the Philadelphia Conference in May, 1950.

At the January, 1951 Board Meeting, with the backing of the committee, a task group to study the problem was asked for and granted. This task group, to which Mr. Raymond Faust, Executive Assistant Secretary of the A.W.W.A., was appointed head, reported to the Association at the Miami Conference in May, 1951. Unusual and extended floor response followed.

At the January, 1952, Board Meeting the writer, again as Chairman of the Committee on Water Works Administration, asked for and obtained approval for the establishment of four new task groups to study and report on Safety Practices in: (1) Water Supply; (2) Treatment and Pumping; (3) Distribution; and (4) Administration. Personnel of these groups have been appointed and are now actively engaged in the study. It is fully anticipated that much concrete evidence of progress will be reported at the May, 1953, Conference of the Association at Grand Rapids, Michigan.

No recent activity of the Association has brought forth greater spontaneous membership participation. The function of these Task Groups is to pursue the preliminary study of personnel safety and working conditions in plant facilities and physical

Human beings as individuals often are unpredictable creatures, but their collective behavior usually can be calculated in advance. Therefore there is much of value in the statement that whenever many minds are put to the task of solving a common problem, the solution is sure to come, because many minds* desire *and* want *a solution. The application of this principle to safety work—the solution of the accident preventive problem—is an achievement in the art of "human engineering."

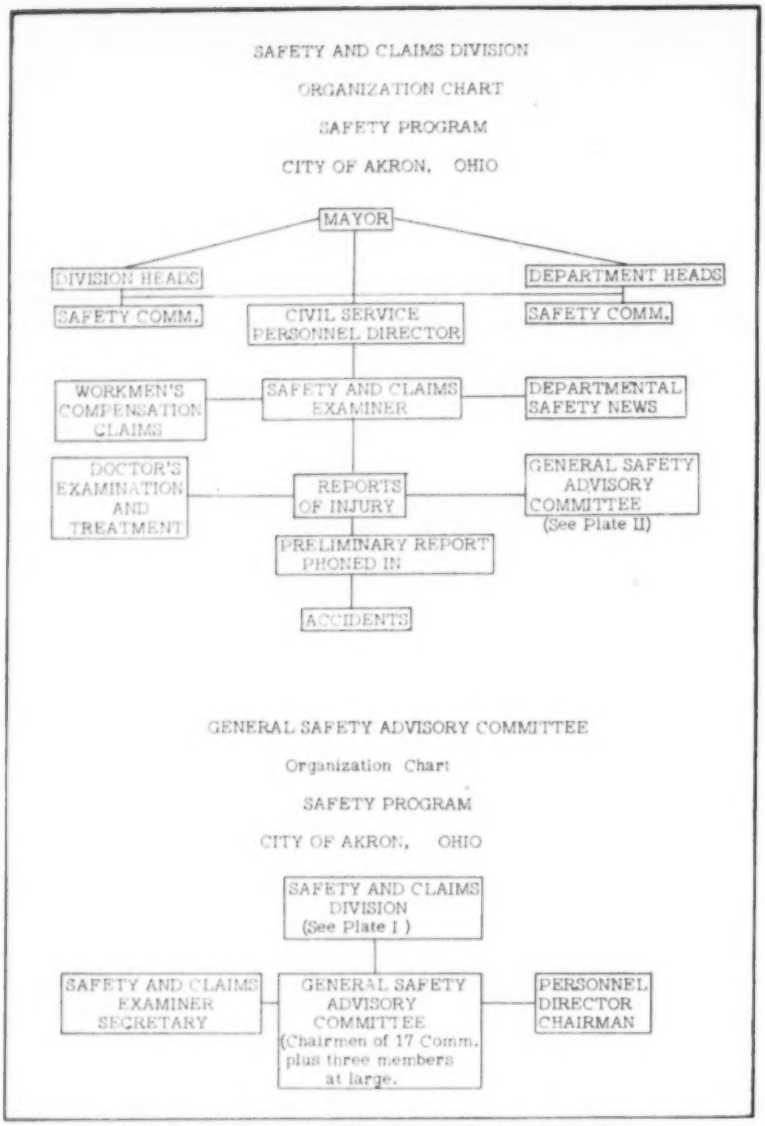


FIG. 1—SAFETY PROGRAM set-up under the Akron plan
Plate I (above) illustrates organization of the Safety and Claims Division
Plate II (below) details the General Safety Advisory Committee

structures in water works. This function may be extended later to encompass the broader field of public safety in water utility construction work. The Groups are presently exploring those areas of safety practices in which local water utilities and departments may profitably engage. First attention is being given to those activities which give greatest promise for immediate results. A preliminary report was programmed for the A.W.W.A. Conference at Miami in 1950 and again at Kansas City in 1951 with outstanding audience participation.

In 1952, for the first time, the A.P.W.A. presented a panel on Public Employee Safety at its Los Angeles Congress.

In December, 1950, the National Safety Council's Board of Directors gave official Section status to the former Public Employee Safety Committee. This Section now takes its place among the twenty-five Industrial Sections of the National Safety Council as the Public Employee Section. Thus, state, county, municipal and federal officials, concerned with employee safety, through this specific section, have representation for the first time on the Industrial Conference of the National Safety Council, and through that, representation on the Board of Directors. Thus, the Water Works man, a municipal employee, has gained official recognition in safety affairs. The importance of this step may be more fully appreciated when we realize that about 6,000,000 public employees are involved. In the Public Employee Section, Mr. Dan Adair is Staff Representative, Mr. Alfred Lateiner, New York, of the City College of New York is Chairman. For the past three years, the writer has been Chairman of the Development Committee on Water and Sewage Works.

The Situation is Serious

It is to be pointed out that public employee safety is not a problem of "no activities" but rather one of "lack of coordination." In general, in those few cities which have programs, municipal activities are usually compared on the same basis as industrial plants. As water works men, we are involved, because no public official can justify, year after year, allegedly permitting his employees to suffer *from three to thirty times* that number of disabling on-the-job injuries suffered by a like number of employees of a well-managed private industry. Statistics now available would indicate such a condition to exist. Injury record systems are not maintained in enough governmental units to provide complete verification. Some cities have excellent safety programs—notably San Diego, Detroit, Cleveland, Baltimore, and New York. Akron has a plan 14 years old.

Akron Plan

The Akron plan has grown progressively more active over the years since 1938. Its organizational set-up is shown in Fig. 1. Under the Akron Plan, each City Division and Department is responsible directly to the Mayor for its own efforts and results in personnel safety. By direct delegation of orders and authority, the department head passes responsibilities to the division heads, who in turn hold all supervision responsible for direct worker contact.

Safety programs and efforts are spearheaded and coordinated through the Safety and Claims Division of the Department of Personnel, Civil Service Commission. Heading this Division is a full time, trained employee, known as Safety and Claims Examiner, Mr. George B. Hay. The status of the City's efforts in safety practice is reported through his office to the departments and divisions to the Mayor. The Examiner's duties cover all activities of the City—office personnel, police, fire, services, water supply, sewerage, parks, highways. His contacts, in general, are with the responsible supervisory heads. His duties include the following:

Safety and Claims Examiner's Duties

Departmental Safety News—This four-to-eight-page pamphlet is distributed monthly to all employees. It contains inspirational, informative and statistical material, of both general and specific interest. To create a general spirit of rivalry, comparative and relative safety standings are reported for each division.

Safety Contests—In line with safety standing, safety contests are promoted from time to time as the occasion warrants. "White Elephants" and "Behind-the-Eight-Ball" trophies are presented for serious deficiencies. Awards for meritorious ratings balance the effort and the reaction.

Training Programs—From time to time it is found beneficial to conduct training courses for supervisory personnel. In the light of a new development or process, training is essential to keep supervisors abreast of progress. Civil Defense training has become an important element of this effort, and all supervisory personnel has been trained in standard First-Aid.

Safety Organizations—As a member of the American Society of Safety Engineers, the Safety and Claims Examiner becomes fully informed on national progress. He affiliates himself with local and state sections. Attendance at local safety conferences, held by industry in particular, affords an outlet for cooperative effort and mutual understanding in kindred problems.

Relative Statistics—Using standard methods, the "safety man" compiles safety statistics for the various city sub-divisions, listing relative standings in severity and frequency. Such data give valuable means of comparison with those few cities that do conduct safety programs of a comparably high pattern.

Compensation Claims—The State of Ohio has a compulsory Workmen's Compensation Law. In proportion to the severity of its accidents the City must pay its just share of expense involved in administering the Act. The value of properly prepared papers and accurate statistics is at once apparent. The monetary value to the City, accruing through accident reduction, also is evident. The "safety man" clears all Workmen's Compensation papers through his office, and, with the aid of the Law Department, acts as the City's agent in matters involving the Compensation Law.

Safety Inspections—In conjunction with a representative of the Industrial Commission of Ohio, periodic inspections are made of the City's work areas. A report is prepared and given to the Mayor with copies to Department Heads. All violations of working conditions are cited with recommendation for correction. A repeated violation draws a sharp, but earned rebuke.

Preliminary Report of Injury
City of Akron, Ohio

FOR FILE USE ONLY
NO. _____
DATE _____
CLAIM MLD. _____

EMPLOYEE NAME _____

DIVISION _____ DATE OF REPORT _____

INJURY OCCURRED _____, 19__ AM PM FIRST REPORTED BY EMPLOYEE _____, 19__ AM PM

NATURE OF INJURY _____

HOW DID ACCIDENT OCCUR? _____

DO YOU BELIEVE THIS WILL BE A TIME LOSS CASE? _____ HOSPITAL OR DOCTOR _____

SIGNED _____
SUPERVISOR

THIS REPORT MUST BE MADE ON DATE OF INJURY

FIG. 2—FIRST REPORT of injury is made immediately

Safety Program Methods

As a part of supervisory training, all supervisors are required to know how to proceed in cases of injury. A knowledge of First Aid is therefore essential. General instructions by the Division Head are given from time to time as new ideas or needs develop.

Accident Report Forms

It is highly important in any program to know what happened and why it happened. A preliminary report is filled in and telephoned to the Division office immediately after an injury accident on the form shown in Fig. 2. Much time was spent in the development of a form on which the supervisor reports the case (see Fig. 3 and Fig. 4). This form is worthy of close examination. It does not attempt to blame or place blame, but is a concise record of what happened and requires supervision to know *why* it happened and what he recommends be done to prevent recurrence. Instructions require that this form, fully filled out, reach the Safety and Claims Office within forty-eight hours of the time of the injury.

Medical Care

The best traumatic surgeons in the City are made available to the injured employee. The employee has the obligation, however, of presenting himself for treatment of all reported injuries. Constant check is maintained of injured employees by supervision upon advice of the attending physician.

Workmen's Compensation Claims

Medical examination is important in the filing of Workmen's Compensation claims. The employee is obligated to file these claims. The Safety and Claims Office aids the employee by securing statements from the attending physician, reviewing the statement, and then forwarding it to the Industrial Commission of Ohio.

Employees know that claims are handled as individual matters and thereby learn to respect their mutual helpfulness. In the case of questionable or contested claims, the Safety and Claims Examiner represents the City before the District Board of Claims or before the Ohio Industrial Commission.

Protective Devices

Many protective devices, such as goggles, gloves, masks and gas detectors, are furnished as an obligation of the City. In certain processes, protective devices are a necessity in order to carry out specific instructions. The employee may go beyond these essentials to further protect himself. Proper connections are maintained to enable the employee to secure, at reduced rates, eye examinations and safety prescription glasses. Advice and encouragement is given the employees in the procurement of safety clothing, and, in particular, safety shoes. Supervision sets the example.

Literature and Posters

Excellent results may be obtained through the consistent, but not boring, use of safety literature, posters or dodgers. Outstanding efforts along these lines are continuous with both the National Safety Council and the Industrial Commission of Ohio.

National Safety Council

Akron is proud of the fact that it was one of the first cities in the United States to adopt the new comprehensive Public Employees Membership privileges, afforded by an Industrial Membership in the National Safety Council. Akron has also participated fully in the studies and activities, during formative years, leading up to the inauguration of the Public Employee Section of industrial coverage organization of the National Safety Council, referred to hereinbefore. The value of this contact to the City's safety program is a matter of continual growth.

Safety Advisory Committee

The activities of the General Safety Advisory Committee (see Fig. 2) provide the main spring controlling the effectiveness of the entire safety program. This Committee is appointed by the Mayor to coordinate the efforts of all safety programs and to effect close liaison between supervision and operating personnel. As presently constituted, it comprises twenty men; chairmen of groups or divisional safety committees plus members at large.

The Committee meets the last Thursday of every second month. It acts as a Board of Review on all accident reports and, through divisional or group committees, follows through on investigations of all matters pertaining to safety—such as rules and plans for betterment. In order to conduct its meetings, the general committee has as its Chairman the Personnel Director of the Civil Service Commission; and for its secretary, the Safety and Claims Examiner.

This advisory committee hears reports of all group or divisional safety committees, safety suggestion made and adopted, and investigates reports of all accidents occurring within their jurisdiction.

From time to time special problems may arise before group or divisional committees—sometimes affecting only one group of employees, sometimes all city employees. As these arise, special investigation is made by a specially appointed subcommittee of this general committee. When reported and acted upon by the general committee, a report is made either to the Mayor of the city or, in some cases, to the Director of the department involved. When followed through in this manner, a prompt reply or action usually results.

SUPERVISOR'S REPORT OF INJURY
CITY OF AKRON, OHIO

FOR FILE USE ONLY
No.
Date Rec'd
Claim MT'd

1. Department ..... Division .....
2. Injured Employee .....
3. Address .....
4. Age ..... Social Security Number ..... Married, Single Widowed, Divorced .....
5. Number and relationship of dependents .....
6. Where did accident occur? .....
7. When did accident occur? ..... 194 . ..... A. M. ..... P. M.
8. Did employee quit work? When? ..... 194 . ..... A. M. ..... P. M.
9. Has employee returned to work? When? ..... 194 . ..... A. M. ..... P. M.
10. Name and address of witnesses .....
11. Experience of employee in this type of work during life time? ..... Years ..... Months
12. Name of job or product employee was working on and nature of work when accident occurred .....
13. What machine, tool, substance or object was most closely connected with the accident? .....
14. How did accident occur? (Give as many facts as possible) .....
15. Describe in detail the nature of the injury and the part of the body affected .....
16. Name and address of physician .....
    Name and address of hospital .....
17. Circle cause or causes you believe were involved in this accident.

PERSONAL FAULTS
A. Faulty Instruction: 1. None 2. Incomplete 3. False
B. Inability of Employee: 1. Inexperience 2. Unskilled 3. Poor Judgment
C. Poor Discipline: 1. Disobedience of rules 2. Interference by others 3. Horseplay
D. Lack of Concentration: 1. Attention distracted 2. Inattention
E. Unsafe Practice: 1. Chance taking 2. Short Cuts 3. Haste
F. Mentally Unfit: 1. Sluggish or fatigued 2. Violent temper 3. Excitability
G. Physically Unfit: 1. Defective 2. Tires easily 3. Weak

MECHANICAL & MATERIAL FAULTS
H. Hazards of Work: 1. Weather 2. Road conditions
I. Poor Housekeeping: 1. Improper piling or storing 2. Crowded conditions 3. Failure to keep job clean
J. Defective Equipment: 1. Tools 2. Vehicles 3. Safety Equipment 4. Miscellaneous
K. Unsafe Building Conditions: 1. Floors 2. Vehicles 3. Openings 4. Miscellaneous
L. Improper Working Conditions: 1. Ventilation 2. Sanitation 3. Light
M. Improper Planning: 1. Failure to provide proper tools 2. Unsafe process 3. Miscellaneous
N. Improper Dress or Apparel: 1. No eye protection 2. No safety shoes 3. Miscellaneous

NOTICE—Original and First Copy of this report must be forwarded to Division in charge of Personnel Safety within 48 hours after accident. Answer questions fully. Additional remarks may be made on reverse side.

FIG. 3—FRONT of detailed report form used to report injury

Divisional Safety Committees

Each division of City Employment now has active safety committees (usually non-supervisory employees) and, in the case of divided operations, may have two or three such committees. All accidents occurring in the division or subdivision covered by a safety committee are immediately investigated by this committee. It is determined by this group what caused the accident and what can be done to prevent similar occurrences.

In addition, these committees receive safety suggestions and complaints from employees, make area inspections and report suggested improvements in methods and work practice to divisional management. This arrangement, at the employee level, is most effective in assuring success to the program.

Akron's Safety Policy

This year, for the first time, the City of Akron, following the example of the City of Detroit, has set forth a definite written safety policy. The Mayor's full statement follows.

* * *

Safety Policy and Procedure
General Policy

The City of Akron believes that safe working conditions for every one of its employees can be attained through use of safety equipment, by proper job instruction, frequent review of safe practices and adequate supervision.

This procedure defines City of Akron's policy with reference to safe practices and established responsibilities for the administration and coordination of an effective safety pro-

What action do you recommend to prevent reoccurrence of this type of injury?

What steps have you taken to carry out these recommendations?

Signature of Immediate Supervisor

Title

In Case of Strain or Hernia Answer These 5 Questions

1. Weight of object handled (Approx.) 2. How high lifted?
3. Was this an unusual strain? 4. Did injury appear suddenly?
5. Has employee ever complained of similar injury?

Division Head's Report

Do you agree with Supervisors choice of cause?

If not to what cause do you attribute this injury

Notice the supervisors recommendation to prevent reoccurrence. Do you have any further remarks?

This report forwarded ..... 194.....

(To be signed by Division Chief) Signature

Title

Remarks:

FIG. 4—REVERSE of detailed report form used to report injury

gram as outlined in the following paragraphs:

I. *Responsibilities:*

A. *City of Akron Responsibility:* The City of Akron recognizes the need for the development of safe working practices for every job. It promotes the advancement of safety in design of buildings and structures, equipment, tools, and other work devices.

B. *Departmental and Divisional Responsibility:* Each department and division shall have a safety plan by means of which safe working practices which are in effect will be brought to the attention of every employee.

C. *Supervisory Responsibility:* All supervisors will consider it an important and essential part of their job to administer the safety program.

D. *Employee Responsibility:* All employees are required as a condition of their employment to follow all established safety practices.

E. *Safety and Claims Division Responsibility of the Civil Service Department:* Responsibility for the promotion and coordination of the safety plan general throughout the city departments lies with the Safety and Claims Division.

DETAILED PROCEDURES

II. *Departmental and Divisional Responsibility:* Although detailed practices will depend on the safety requirements of the departments, the general pattern of the plan shall be as follows:

A. *Safety Information:* Through the established lines of departmental organization, safety information shall be given to employees. Division heads shall arrange for regularly scheduled safety meetings with all their supervisors. The supervisors shall transmit safety information to their employees either through group meetings or by discussion with individual employees.

Written safety rules shall be developed and formulated for safe working practices. These rules must be kept up to date, and must be thoroughly explained and made available to every employee.

B. *Safety Suggestions:* Such suggestions made by employees to their supervisors will be referred through the line organization to the department heads. Prompt and definite replies shall be made to all suggestions.

C. *Hazardous Working Conditions:* All such conditions reported shall be studied and corrected either through the elimination of the hazard or by proper instruction and adequate supervision.

D. *Occupational Requirements:* The ability to perform work assignments safely shall be a prime factor in the selection and promotion of employees.

E. *Departmental Safety Representative*:* A representative for each division shall be selected to act as the coordinator of the safety plan within the division and as a medium of contact with the Safety and Claims Division.

F. *Safety Performance:* Divisions shall submit data periodically to the Safety Division, in a form which will facilitate comparison with past performance.

III. *Supervisory Responsibility:*

A. *Success of Program:* The success of the safety program will depend to a great extent on the efforts of those who administer it, particularly first line supervisors.

B. *Correcting Unsafe Conditions:* All supervision shall be constantly on the alert to observe unsafe working practices or conditions with the aim of immediate correction**.

C. *Safety Education of Employees:* The supervisor shall be sure that employees are well acquainted with existing safety rules and see that the rules are enforced.

1. Problems relating to safety on the job shall be discussed by supervisors either in group meetings or individually.

2. Supervisors shall encourage employees to submit safety sugges

*The duties of the representative shall not conflict with the responsibilities of supervisors for the safety of their employees.

**If immediate correction is not possible, the situation should be reported to the next higher level of supervision.

tions and see that replies are made promptly.

3. Safety training of new employees shall be directed or conducted by supervisors. Safety and Claims Division to assist.

IV. *Employee Responsibility:*

A. *Condition of Employment:* All employees shall be required "as a condition of their employment" to follow all safety practices which are established for the protection of themselves, their fellow employees, and the public.

B. *Employee Co-operation:* The City of Akron expects that each employee will accept safety as a personal matter and cooperate in the safety program by developing safe work habits and by reporting hazardous working conditions.

V. *Safety and Claims Division Responsibility of Civil Service Department:*

A. *General Functions:* This division will assist in the development of departmental and divisional safety programs and will coordinate interdepartmental safety practices and will assist with safety engineering problems and keep the other departments informed of the safety performance within the city government.

B. *Investigation of Unsafe Practices:* This division is authorized to investigate practices or conditions which have caused, or may cause, accidental injury or property damage and make recommendation for their correction.

C. *Outside Relations:* The City of Akron's relations with outside industrial safety organizations or associations shall, in general, be carried on through the Safety and Claims Division. Public contact on industrial safety matters, however, may frequently involve the activity of other departments and divisions, and, under such conditions, the Safety and Claims Division will function jointly by mutual agreement, with the department or division concerned.

Approved August 25, 1952
Chas. E. Slusser, Mayor-Manager

* * *

Water Division Activities in the Safety Program

In the operation and application of the safety program as above outlined and described, the Water Division of the City of Akron has played an important and integral part. Full cooperation is given and its employees take a prominent place in all committee activities. Supervision is awake to safety possibilities as old and new employees alike come forward to learn new and improved methods for their own protection. Over a ten-year period an encouraging downward trend in lost-time accidents has resulted.

Safety-mindedness is a product of self-discipline, good instruction, proper direction and continuous exemplification.

Water utilities are industrial establishments, and as such, have no valid reason not to use well-known and long established means of employee protection. There is no real doubt that an individual water plant can do an outstanding and effective job in its own sphere of activity if its management will take the time. It is submitted, however, that the plant could do a better job and produce better results if it received the stimulation to be had from group effort, opportunities for comparison with others in the water works field, and the mutual pooling of experiences and ideas.

Mr. Ned H. Dearborn, President of the National Safety Council, said recently, "Safety is a race. It is an unending competition in which we must everlastingly learn new methods to deal with new problems which our own ingenuity has created."

A war of human making is in progress. With it comes an inevitable disruption of our labor forces. In this, water works personnel will be lost, new men will be employed, and new problems will develop, while old ones remain. We can ill afford the loss which accidents will bring, at a time when water works plants will *again* be called upon to play a major role in defense production.

Human error, or lack of regard for the obvious, has been said to be the most important contributing factor in safety relations. Man *knows* the techniques of safety, but he *lacks the will* and the *moral* fortitude required for exemplification of the proper *attitude* toward safety. We require self-discipline, acquired through the use of our knowledge and applied by our intelligence. The success of numerous industries in reducing work injuries proves that the application of *known* preventive methods, by water works personnel and management mutually, would reduce the water utility accident toll to a gratifying degree.

The immediate need is to obtain and release wider and more complete knowledge of the *types* of accidents and the presently acquired knowledge of the *cause* and *control*. The activities now under way by a committee of the American Water Works Association and the N.S.C. will fill that need. In the best tradition of our democratic processes the work we are called upon to do requires the finest kind of voluntary cooperation between employee and employer.

Conclusion

Safety is a plan for living and a philosophy, whereby the well-ordered individual adds to the sum total of a satisfying life. The safe workman considers, in his approach to a job of work, not only proper tools, necessary equipment and selected materials, but also a *safe* plan for its execution. A job cannot be accomplished properly unless it is concluded safely. Safety-mindedness is a product of self discipline, good instruction, proper direction and continuous exemplification.

When through the prestige of the A.W.W.A. an authoritative approach to the safety problem has been attained, the most valuable result will be the building-up of a safety-consciousness among the members of the AWWA. This is a personal problem to which each must dedicate himself in altruistic thinking and personal effort.

A safe business; a safe employer; a safe employee—these are not accidents!

Pilot Plant Proposed for Cincinnati

According to a press report, an experimental pilot plant to aid the city in accurately designing the planned $21 million Millcreek sewage disposal plant was proposed by the Cincinnati Sanitation and Sewage Committee of the City Charter Committee.

The committee estimated that the pilot plant for "pilot scale" operations could be set up for less than $100,000, exclusive of the building. It said it is not sound practice to design such a disposal plant on the basis of laboratory data, experience of other cities, and the experience to be gleaned from the Little Miami sewage disposal plant now under construction.

The city's Sewage Disposal Engineer declared, however, that the pilot plant is unnecessary. He noted that the city has engaged the services of competent engineers who have wide experience with the building of plants in other cities and that he, therefore, was confident that the city was on solid ground in its planning.

WATER WORKS PRACTICES

OPERATION • MAINTENANCE • MANAGEMENT

History of Water Supply Biblical Times to 1850

The Second of a Series

by GEORGE E. SYMONS, *Ph.D., Consultant & Technical Editor, Larchmont, N.Y.*

BEFORE proceeding with the second lecture in this course on "Water Works Practices," I'd like to answer a couple of questions that have been asked in reference to the subject of water, itself:

Q.—If water is a "universal solvent" does sea water contain some amount of all natural chemical substances?

A.—A single cubic mile of sea water contains 166 million tons of dissolved salts, more than $90,000,000 worth of gold, about $10,000,000 worth of silver and about 12 billion pounds of magnesium. The seas contain 99 per cent of the world's bromine supply. Both bromine and magnesium are now being extracted from the sea on a commercial scale.

Q.—How much land is destroyed by floods each year?

A.—The total figure is incalculable. In one flood in 1926, the "relatively small" Sangamon River, which drains a mere 5000 sq. mi. had a flow of 30,000 cu. ft. per sec. and a solids content of 0.3 per cent. In one day the Sangamon River carried away 500,000 tons of top soil, most of which came from farm land.—When the Mississippi River is at flood tide, it carries an estimated 12.5 million tons of farmland each day into the Gulf of Mexico; enough farm land to equal six inches of top soil over 10,000 acres—a staggering irreparable economic loss to the country.

Q.—How big is the water business?

A.—Probably the biggest business in the world. In the United States, alone, production of water for public, industrial, and irrigation uses is more than 170 billion gallons per day or nearly 750,000,000 tons a day. This is equivalent to approximately 1000 gal. per day per capita. Public water consumption alone averages about 127 gal. per person per day, the balance going into industrial uses.

Early History of Water Supply

A. Ancient History

1. COMMUNITY DEVELOPMENT IN ANTIQUITY

Water was essential to both animal herds and man for sustenance. Therefore, he developed his communities along waterways. When these waterways became means of transportation, community life and cities grew wherever there was a transhipment from water to other means of transportation.

2. SANSKRIT LORE

Probably the earliest written records of water purification date to 2000 B.C. in a collection of medical lore in Sanskrit. Storage of water in copper vessels, exposure to sunlight and filtering through charcoal were recommended as was boiling of "foul water."

3. EGYPTIAN PRACTICES

Pictures found on the walls of Egyptian tombs of the 13th and 15th century B.C. show men siphoning off settled water (or wine) from what was probably the first apparatus for clarifying water.

4. CHINESE PRACTICES

The art of obtaining potable water was not unknown to the ancient Chinese peoples. Centuries before Christ, the Chinese are reported to have had wells as deep as 1500 ft. They also employed alum to clarify muddy river water centuries ago.

5. BIBLICAL HISTORY

(a.) That the early Hebrews were water-conscious is strongly evidenced in the Bible. The word "water" appears about 500 times in the Bible with references to drinking, washing, anointing and other uses.

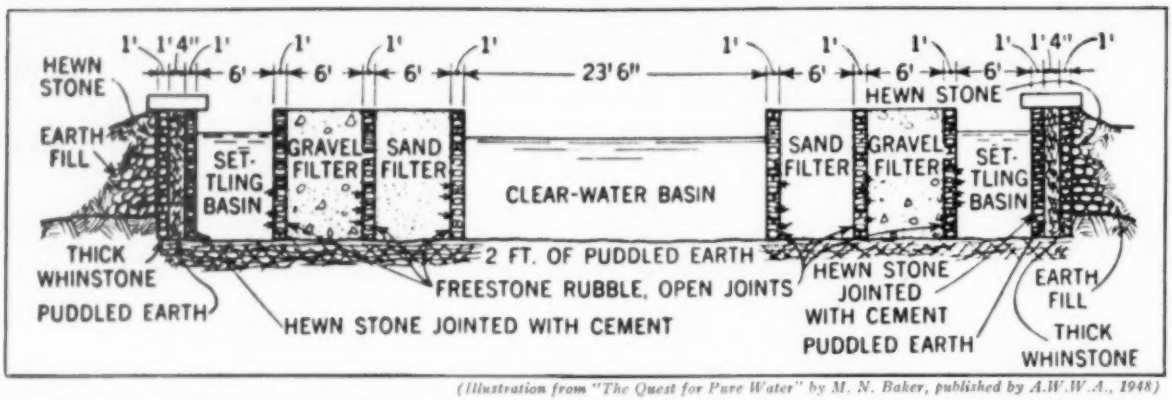
(b.) In the first four chapters of the Bible, 125 verses mention water and most of them deal with some phase of sanitary engineering. While Moses is considered to have been the "Father of Sanitary Engineering," there is little in the Bible to indicate that water purification was practiced.

(c.) Algae and deoxygenation of rivers are indicated in Exodus 7: "and all waters were turned to blood and the fish that is in the river shall die, and the river shall stink, and the Egyptians shall loathe to drink the water . . . " The modern counterparts of this phenomenon were the "red tides" in 1947 off the Gulf Coast of Florida, when these Dinoflagellate "blooms" killed myriads of fish.

(d.) Infiltration galleries are indicated in the Biblical passage which says: "And all the Egyptians digged round about the river for water to drink for they could not drink of the river."

(e.) True treatment is indicated in the passage about Moses, who "sweetened the bitter waters of Marah, by casting into them a tree which the Lord shewed him" and Elisha "healed" a spring by casting salt into it.

This article is one of a series on the general subject of "Water Works Practices." Each article has been developed by Dr. Symons from his notes for a Water Works Short Course and each is presented in the simple style of a short course lecture. The series has been designed to be of interest and aid to small plant operators, new operators, students, and any who may wish to review the fundamentals of water works practices.—The Editors.



(Illustration from "The Quest for Pure Water" by M. N. Baker, published by A.W.W.A., 1948)

FIRST KNOWN FILTER to supply an entire city with water—Paisley, Scotland, 1804. Influent water was delivered through trench to ring-shaped settling chamber, then through two lateral-flow filters to central clear water chamber; final flow was to hillside storage tank from which water was carted to consumers.

(f.) In Exodus 15 and 17, reference is made to twelve wells of water and three score ten palm trees (an oasis) and as the Hebrews continued their journeys with Moses it was he who "smote the Rock in Horeb, when there was no water for the people to drink." This water bearing sandstone has been located in modern years by travellers who were able to duplicate Moses' "miracle."

(g.) One of the wells of Biblical lore was the well publicized Joseph's well, which was 297 ft deep and from which the water was lifted by burro-power.

6. Early Greek and Roman Practices

(a.) In the history of the few centuries before and after Christ, there are many references to instances of water "conditioning" by macerated laurel, powdered barley in a bag, stage sedimentation in cisterns and wick siphons.

(b.) Aristotle in the 4th Century B.C. mentioned filtration through porous vessels; Hippocrates, the "Father of Medicine," wrote on the relation of water to health and disease; and in the reign of Nero the sage, Pliny, wrote that "water is more wholesome when boiled."

(c.) Roman Aqueducts. In the period about 300 B.C., the search for pure water led Roman engineers to build huge aqueducts which brought in good water from great distances to the city. Fourteen aqueducts built prior to 300 B.C. had a capacity of 500 mil. gal. a day.

(d.) Sextus Julius Frontinus, who became water commissioner of Rome in 97 A.D. was the first "water engineer." It was he who wrote the first detailed description of a water works system.

[This classic treatise was translated in 1899 by Clemens Herschel, the American engineer who invented the now widely used meter which he named the Venturi Meter because the development involved adaptation of the Venturi Tube.]

Of particular interest is Frontinus' description of a settling reservoir at the head of one of the aqueducts. Settling had been used in Carthage and Arabia in 100 and 200 B.C. During Frontinus' era, lead pipe was used for connecting to the distribution system and water rates were based on the size of the lead pipe. There were numerous bootleg connections; but since lead was expensive, confiscation of these illegal connections reduced the number of non-paying consumers.

7. The Dark Ages

During the next 1500 years after Frontinus, little advance was made in the art of water procurement, treatment or purveying. Wood pipes came into use, pumps were invented, but modern students make reference to very few treatises on the subject during that long period of the "dark ages."

B. Middle History (1600-1850)

1. Germany

Hard wood *(arbor vitum)* pumps were first used in Hanover in 1527.

2. Italy

The filter cisterns of Venice had reached a "perfected state" by 1550 and were still in use 300 years later. Earliest filter design was in 1685 by Porzius, who proposed multiple filtration through sand, preceded by straining and sedimentation.

3. France

(a.) Household filters of sand in copper containers appeared about 1550.

(b.) First iron pipes were installed in 1664 to carry water from the Seine River to the parks of Versaille, a distance of 15 miles. These early cast-iron pipes which are still in existence, were installed at the direction of King Louis XIV.

(c.) Another first, was the filter patent issued to Amy in 1745; it was for a perforated box filled with sponges.

(d.) First filter plant for Paris was built in 1806 by Happey on the Quai des Celestins, a wharf near the city hall. The plant ran for 50 years; it had horse driven pumps, three settling tanks which were filled and decanted successively and the filter media were sponges which had to be washed every two to three hours. Delivery was by 130 men using 75 casks and 109 horses.

(e.) In the 1840's, Darcy designed the first mechanical filter which antedated by several years, the American rapid sand filter.

4. Scotland

(a.) Before 1790, a slow sand filter had been built in Lancashire, but the first filter plant to supply a whole city was in Paisley, Scotland, home of the famous Paisley shawls. The plant was designed by John Gibb in 1804. It was a concentric ring sedimentation basin with horizontal flow through gravel, then through sand (also rings) to a center clear water basin.

(b.) In 1807, Thomas Telford, first President of the Institute of Civil Engineers and Chief Engineer of the Glasgow Water Co., built a filter plant and although his filters were unsuccessful, Glasgow was the third city of the world to have a filtered water supply.

(c.) Filter galleries came into being in 1810 at Glasgow, one of which contained so much iron that the supply had to be abandoned.

(d.) Robert Thom in 1827 designed the forerunner of a modern filter. It was a slow sand filter for the City of Greencock and the idea was born

on a golf course. This was a self cleaning filter, utilizing upward flow for washing and the filter media was about 5 ft of very fine clean sharp sand.

5. ENGLAND

(a.) *Arbor vitae* pumps were used in London in 1582. In 1752, the first *lignum vitae* pumps were used; the first steam pump was operated in London in 1761.

(b.) In 1791, Peacock, in London, proposed an up-flow filter with a down-flow for washing. This design incorporated superimposed spheres of decreasing size on a false bottom, with graded sand. (This idea of superimposed spheres was also used in the Wheeler Filter Bottoms perfected more than a century later. Up-flow filters were also proposed for several cities in France between 1840 and 1870 but none was apparently successful.

(c.) James Simpson, Engineer of the Chelsea Water Works Co. of London, is one of the best known filtration pioneers. After three years of experimentation, he designed and built the first slow sand filter in London in 1829. Its surface was in ridges and furrows and it was cleaned by hand. Although bacteria were unknown at that time, the effectiveness of filtration in preventing disease was recognized as time went on.

6. UNITED STATES

(a.) Boston is supposed to have had the first publicly owned water supply in the U.S. (1652) and New York City began a limited distribution system in 1744. The first pumped supply was at Bethlehem, Pa. in 1754, using 5-inch *lignum vitae* pumps and bored hemlock logs. Other older works included Providence, R.I. (1772), Worcester, Mass. (1798) and Philadelphia, Pa. (1801), where the first cast-iron pipes were laid in this country in 1804.

(b.) Richmond, Va., in 1832 built the first U.S. filter plant, designed by Albert Stein; it incorporated up-flow backwash, but it was not successful.

(c.) In 1836, Robert H. Eddy, Civ. Engr., advised the city of Boston to go far enough afield to get water that would not need to be filtered. This policy was adopted in 1848 and has been followed since, as has a similar policy in New York City and a number of other communities.

C. Summary

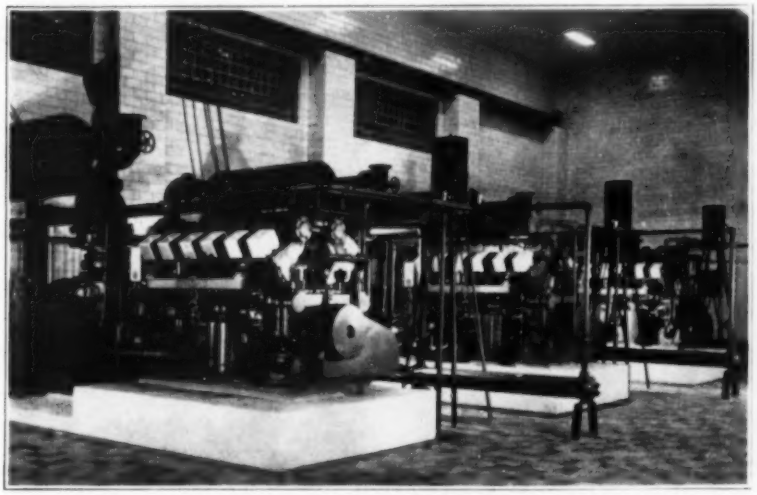
The early history of water supply and treatment is not an exercise in date memorizing. Such dates as are given here serve merely to make it apparent that despite the vital importance of water to man, he took a mighty long time to do much about providing himself with a potable supply.

Next Lecture—Modern History of Water Supply 1850-1950.

Correction

Q.—What is the absolute maximum density of water and at what temperature does it occur?

A.—The absolute maximum density of water is 0.999972 grams (plus or minus 0.000002 grams) per cubic centimeter or 1.00000 g per milliliter at 3.98° C. or 39.13° F., which is just *above* the freezing point, NOT "just below" as was inadvertently stated in the first lecture in the January issue of *Water & Sewage Works* on page 23, column 3, paragraph 4, line 6. (Thanks to W. R. Gelston of Quincy, Ill., and to Ray Derby of Los Angeles, for pointing out this slip-up.)



Three Climax 220 H.P. sludge gas engines driving Roots-Connersville blowers in Roanoke activated sludge plant

Sludge Gas Engines Power New Roanoke Plant

Two pumps and three blowers are driven by gas engines—electric motors operate one pump and one blower

Roanoke, Va., has recently placed in operation the State's largest complete sewage treatment plant. It is of the activated sludge type, designed to treat the wastes from a population of 140,000 to such a degree as to return the effluent to Roanoke River clear, stable, and of better quality than the river itself.

The entire project was built at a cost of approximately $4,000,000.00, divided almost evenly between the intercepting sewers and the sewage treatment plant. The most modern type of equipment is housed in an attractive colonial type brick structure. Interior walls are of variegated texture quarry tile, sills of the pump and blower rooms are of acoustic tile, and windows are of steel construction.

Blower equipment consists of four Roots-Connersville blowers with a total capacity of 20,000 c.f.m., one of which is driven by a 250 H.P. electric motor and three by Climax Model V-125, 12 cylinder sewage gas engines each rated 220 H.P. at 670 r.p.m., 70# BMEP.

There are three Worthington 12 MGD raw sewage pumps operating against a 40 ft. head. One pump is motor driven and two are driven by Climax Model V-80, 8 cylinder sewage gas engines rated 134 H.P. at 700 r.p.m., 70# BMEP. By means of automatic speed control the engine driven pumps will operate with a varying capacity of from 6 to 16 MFD, governed by the rate of flow through the plant.

Heat for the four digester tanks and the building is obtained from the jacket water and exhaust of the gas engines.

Engineers responsible for the design and installation of the complete system are Alvord, Burdick & Howson of Chicago, and Mattern & Mattern of Roanoke, Va. The operation of the plant is under the supervision of F. C. Funnell, Jr., Plant Supt.

Miami in the LIMElight *and at a Profit!*

A report on the three-year-old Miami Lime Reclamation Plant –operating experiences, costs, maintenance and repair

by C. F. WERTZ*, *Resident Engr., Dept. of Water & Sewers, City of Miami, Florida.*

EARLY in 1949 the Department of Water and Sewers, City of Miami, Florida, put into operation at its main water Softening & Filtration Plant what is believed to be the first rotary-kiln lime production plant in the world owned by a municipality. The actual calcining of water softening plant sludge was not new. For a number of years paper mills throughout the country have dewatered precipitated calcium carbonate and recalcined it in rotary kilns. One American water plant antedated Miami by five or six years with a vertical kiln which produces a few hundred pounds of lime per hour, and a British water company has had a short rotary kiln in operation since about 1933. When the Miami Dept. of Water & Sewage invested approximately $800,000 in a lime recalcining plant it was anticipated that operating results would be watched with great interest. After three-and-a-half years of operation, it is with considerable pride that the Department accepts the invitation of the editor of *Water & Sewage Works* to publish the resultant profit on the investment.

* Representing Day & Zimmerman, Consulting Engineers, Philadelphia, Pa.

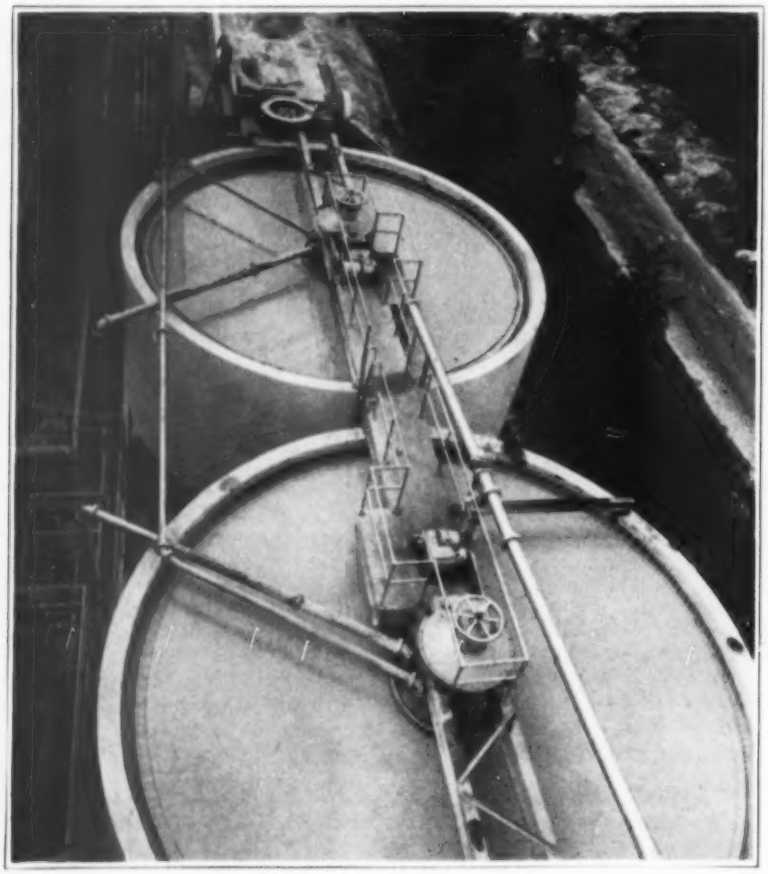


Fig. 1—SLUDGE THICKENING tanks equipped with Hardinge thickener mechanisms

Operating Statistics

The first few months, while the customary "new-plant operating bugs" were being eliminated, the plant operated intermittently. Since July 1, 1949, it has operated almost continuously, with only a few necessary shutdowns for maintenance. Operating statistics for the three full fiscal years from July 1, 1949, through June 30, 1952, are set forth in Tables I and II.

The unaccounted for item is the result of a combination of inaccuracies in the plant report on lime produced and a low-percentage error in the totalizing mechanism of the lime feeders. The weight per cubic foot of the lime produced varies from 35 pounds for light-burned to 44 pounds for hard-burned material. Since the calcium oxide content of the finished product varies day by day from 90 to 94 per cent, the weight varies also.

There are no weigh scales of any kind at the lime plant. A cubic-foot steel box is filled from the discharge screw once each hour and the time of filling and weight is recorded. The daily output is calculated from these hourly readings. The weight totalizers on the Omega lime feeders, which are checked periodically, are generally

Table I
PRODUCTION COSTS

	Fiscal Years		
	1951-52	1950-51	1949-50
Supervision	$ 3,372	$ 3,499	$ 2,413
Labor	44,574	40,802	40,338
Power	11,276	11,172	9,928
Fuel Oil	62,980	51,538	46,549
Supplies and Exp.	2,798	3,637	8,119
Maintenance	15,826	9,036	8,505
Operating Cost	$140,826	$119,684	$115,852
Outside Lime sales	28,644	22,629	21,467
Net Operating Cost	$112,182	$ 97,055	$ 94,385

Table II
LIME PRODUCTION

	Fiscal Years		
	1951-52	1950-51	1949-50
Tons—Plant Report	19,883	18,029	17,082
Used at Hialeah and Southwest Plants	16,305	14,953	14,303
Sold to Outside Customers	2,728	2,159	2,160
Added to Storage	+50	+155	—30
Production Accounted for	19,083	17,267	16,433
Unaccounted for	800	762	649
Percent Unaccounted for	4.0	4.2	3.8

Fig. 2—SCRAPER HOIST at sludge lagoon

found to be off a few per cent in their accuracy. Flooding, due to occasional pockets of powdery lime, tends to increase the inaccuracies.

Costs

Using the 1951-52 figure for lime production accounted for and the gross lime plant operating cost, the cost-per-ton was $7.38. During the same period, the average cost-per-ton for lime used at the Hialeah and Southwest Softening Plants, after taking credit for the proceeds of outside sales, was $6.88. Operating expense does not include any allowance for interest or depreciation (Table III).

Table III
INTEREST & DEPRECIATION—1951-52

	Average Rate	Estimated Expense
Interest	2.2%	$17,989
Depreciation	1.5%	12,265
		$30,254

Total investment in lime plant at June 30, 1952, was $817,672, an increase of $24,151 over the original construction cost of $792,521. The 1.5 per cent set aside for depreciation is admittedly too small for this type of plant but it is the percentage actually set aside in a Depreciation Reserve Fund on the total investment of the Department's utility plant, amounting to $22,313,266 on June 30, 1952, which total utility plant includes such items as transmission mains, distribution mains, and services, valued at $13,618,715, all of which have a long-service life.

Savings Indicated

At the present day average delivered purchase cost of $20 per ton for rock lime shipped from Tennessee, Alabama, or Arkansas, the lime used at the Hialeah and Southwest Plants (16,305 tons in 1951-52 and 14,953 tons in 1950-51) would have required a total expenditure of $326,100 and $299,060, respectively.

A comparison of these estimated aggregate purchase costs with actual net lime plant expenses, indicates gross savings sufficient to cover interest and depreciation, and yield a substantial profit on the lime plant investment (Table IV).

Table IV
PRODUCTION COSTS VS. PURCHASE COSTS

	Year Ended June 30, 1952	Year Ended June 30, 1951
Assumed aggregate purchase costs for lime used at Hialeah and Southwest plants	$326,100	$299,060
Actual net lime plant expenses, excluding interest and depreciation	112,182	97,055
Indicated gross savings	213,918	202,005
Estimated interest and depreciation expense	30,254	28,900
Indicated profit return on investment	$183,664	$173,105
Investment in lime plant, as of June 30, 1952	$817,672	$798,778

Description of Lime Plant

The lime calcining plant was designed for a rated capacity of 80 tons per day of quicklime. It will be noted in the detailed description which follows that this capacity has been exceeded during recent plant-capacity tests.

Sludge Thickening

Calcium carbonate sludge from three Dorr clarifiers is pumped to two 32-feet diameter by 15-feet deep concrete thickener tanks equipped with Hardinge thickener mechanisms having variable speed control (Fig. 1). Additional make-up sludge may be recovered, when needed, from a 20-acre sludge lagoon by means of a scraper hoist (Fig. 2) and trucked 1¼ miles to the plant, where a wash-mill reduces it to a liquid state. This liquid sludge is also pumped to the thickeners and mixed with the new plant sludge.

The thickened slurry, containing 20 to 30 per cent solids, is pumped by two Wilfley sand pumps (Fig. 5) to an adjustable spiral scoop slurry

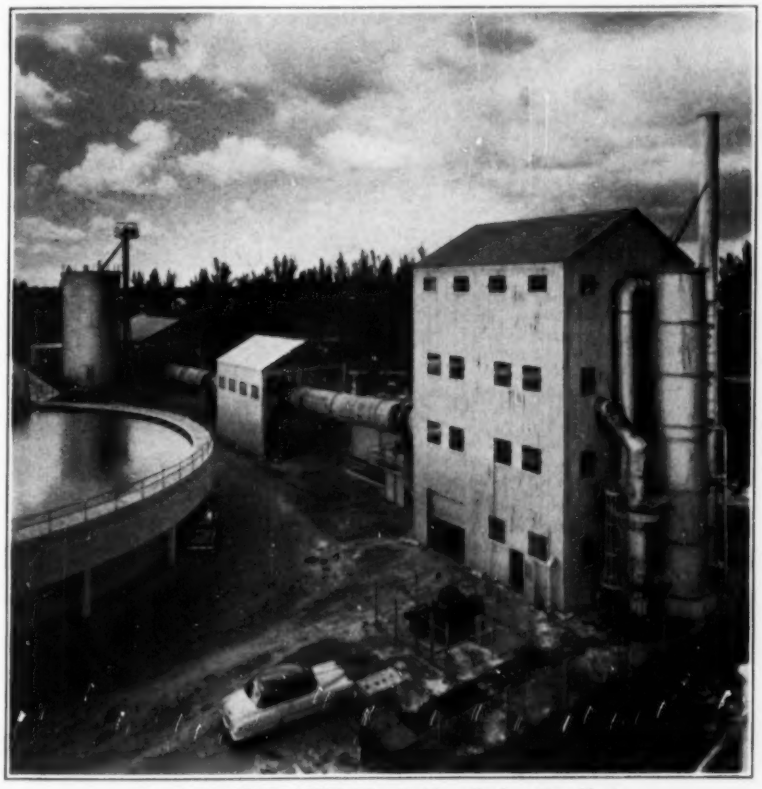


Fig. 3—GENERAL VIEW Miami's Lime Reclamation Plant

(On right)—Feed end building, housing slurry feeder, dewatering centrifuge, ribbon conveyor, plenum box inlet to kiln, induced draft fan, CO_2 compressors. At near end of building the tower gas scrubber.
(Center)—Sludge thickeners and slurry pump pit behind kiln, housing over kiln drive, and sludge pumps.
(On left)—Discharge end building, where kiln is fired and brine cooled. In this building is the central control panel. Beside building is lime storage silo and bucket elevator. Lime is transferred from silo to feeder bins by airveyor system.

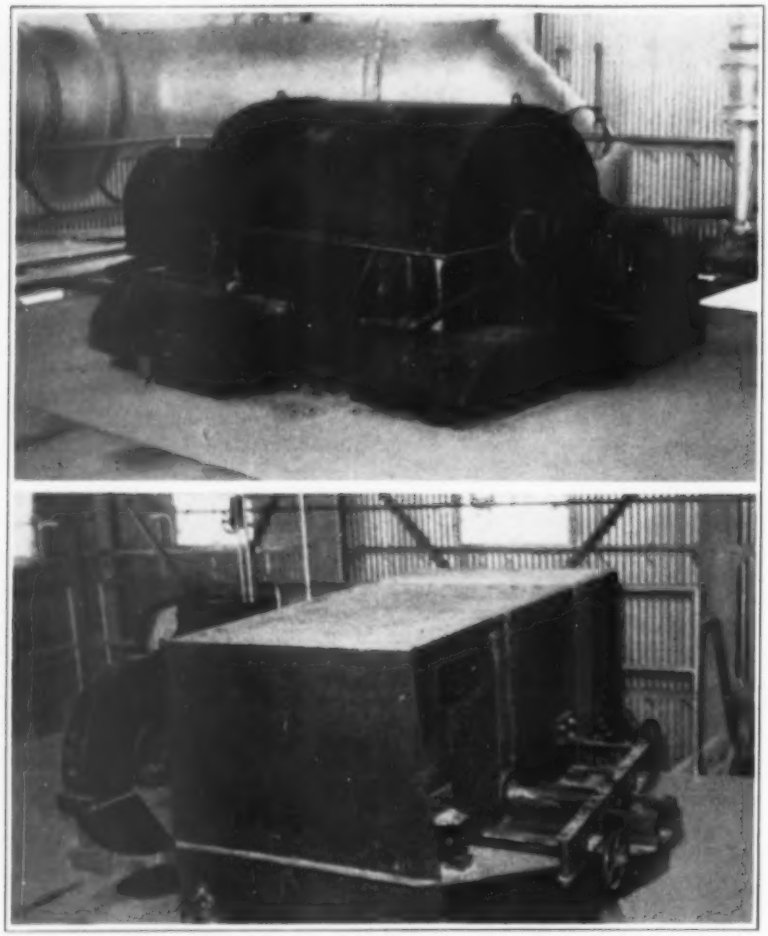


Fig. 4a—BIRD CENTRIFUGE sludge dewatering machine
Fig. 4b—SLURRY FEEDER, of spiral scoop type, which feeds the centrifuge above

feeder (Fig. 4-b), located on the top floor of the feed building. This feeder has a capacity of 10,000 gallons per hour and is driven by a four-speed motor synchronized with the four-speed kiln motor. These motors are remotely controlled by push buttons from the control panel in the discharge building. Excess slurry over kiln feed requirements is returned by gravity to the thickeners.

Sludge Dewatering

The slurry flows by gravity from the feeder to a dewatering Bird Centrifuge (a 40" by 60" centrifugal filter) driven by a 60 HP motor (Fig. 4-a). This filter has a guaranteed capacity of 75 tons per day, dry weight, of calcium carbonate ($CaCO_3$) filter cake, which will contain about 35 per cent moisture. This would produce but 42 tons of finished lime per day. However, recent plant capacity tests have delivered 90 tons of lime, which represents a rate through the centrifuge of approximately 160 tons, dry weight, of sludge per day. This cake contained 66.8 per cent solids and the filtrate, or waste water, contained 4.7 per cent solids.

Filter cake drops into a Link-Belt ribbon screw conveyor (Fig. 6-a) which delivers it through a plenum box into the feed end of the kiln. Waste water flows by gravity to the sludge lagoon.

Rotary Kiln

The rotary kiln (Fig. 3 and front cover) is a F. L. Smidth & Co. four-support UNAX kiln of all-welded design, 7.5 feet inside diameter by 230-feet long, with integral multi-cylinder UNAX cooler. The kiln is driven through a reducing gear by a four-speed motor which can impart to the kiln selective speeds of 1.09/.85/.57/.43 revolutions per minute. Normally the kiln is operated at 1.09 rpm. An auxiliary gasoline-engine drive is provided for emergencies.

The feed end of the kiln contains a 37-feet long heat-recuperating chain section (Fig. 6-b) which weighs approximately 11,000 pounds. This chain section promotes an efficient exchange of heat between the hot exhaust gases and the incoming sludge. The effect of the chain recuperative system is reflected in the low fuel consumption of approximately 55 gallons of fuel oil per ton of lime produced.

The UNAX cooler consists of eight cylinders, equally spaced, around the outlet of the kiln (Fig 6-c). Each cylinder contains spiral conveying flights of heat-resistant cast iron. As the burned lime drops into these coolers and moves towards the collecting hopper it is cooled from 2,100°F to approximately 600°F by the secondary combustion air. This effects another exchange of heat that also helps improve the overall efficiency of the operation. From the collecting hopper the lime drops into screw conveyor which discharges to the boot of a bucket elevator. This elevator carries the material to a 400-ton steel storage silo, 25-feet in diameter by 46-feet high.

The kiln is Bunker "C" oil fired by a mechanical, high-pressure, oil-atomizing system. The oil is preheated to approximately 200°F and is delivered to the nozzle under pressure from 240 to 260 psi. A 100,000-gallon steel oil storage tank is located immediately adjacent to the discharge building.

Primary combustion air, which is drawn from the top of the kiln end shield, is provided by an air blower rated at 2,300 cfm of 200°F air. Secondary air is drawn through the cooler cylinders. Temperatures in the firing zone of the kiln are maintained at from 2,100°F to 2,200°F.

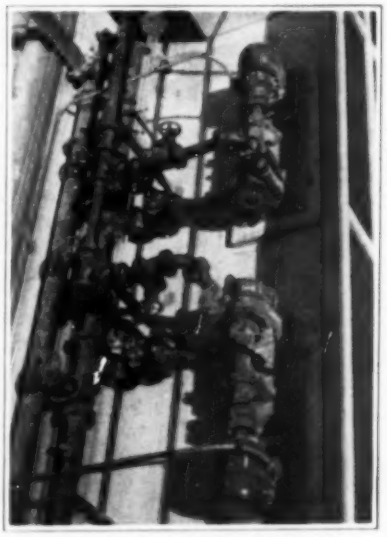


Fig. 5—SAND PUMPS which deliver $CaCO_3$ sludge slurry from thickening tanks to slurry feeder (4b)

Draft control is provided by a 30-inch butterfly damper (Fig. 7-b) in the exit duct beyond the tower scrubber and ahead of the induced draft fan. This fan had an original capacity of 12,500 cfm of moisture-laden gases at 90°F to 100°F but its capacity has been increased to approximately 14,000 cfm by changing the V-belt pulleys (Fig. 7-b). The degree of opening of this damper is determined by the per cent of oxygen remaining in the exhaust gases. It has been found that a residual of two per cent oxygen in these gases will result in a maximum oil efficiency without any danger of producing obnoxious stack fumes. Therefore, this point is carefully watched and damper control is all important.

Stack Gas Scrubber

Because the lime plant is located within a quarter mile of the business area of the City of Hialeah, and is surrounded by residential areas, it was necessary to eliminate all possibility of dust nuisance. A Bartlett Hayward water scrubbing tower, with humidifier, (end of building in Fig. 3), is installed between the kiln and the induced draft fan; its rated capacity for cleaning and cooling is 20,000 cf of gas per minute. Gases are first passed through two atomizer sprays in the humidifier section before moving vertically upward in the 50-feet-high tower section through four water sprays spaced about ten feet apart. Approximately 350 gpm of water is used; all dust is effectively removed and the 400°F temperature of the gases is reduced to 100°F.

Carbon Dioxide Re-use

Two Nash Hytor compressors (Fig. 7-a), each with a capacity of 570 cfm of free gas at 100°F against a gage pressure of 8 psi, deliver a portion of the stack gases, which contain approximately 25 per cent CO_2, to the recarbonating basin of the water softening plant.

Waste water from the tower scrubber, spillage from the sludge thickeners, and other waste water, discharges to a sump from which two 600-gpm sump pumps return it to the inlet end of the mixing basins of the softening plant.

Central Control Station

A central control panel (Fig. 9) in the Discharge Building affords complete control for all equipment. It includes a recording pyrometer; per cent carbon-dioxide and oxygen recorders; recording oil-pressure, flow and temperature meter; air-operated combustion control unit; draft gage; various alarms, etc. An intercom-

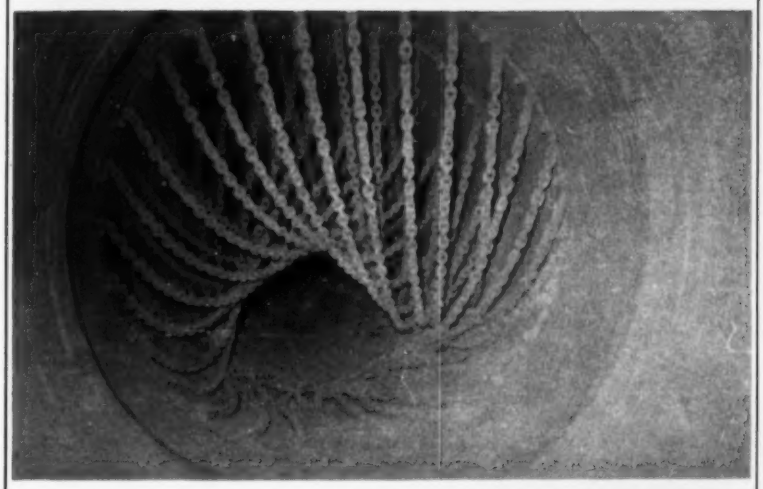


Fig. 6a—RIBBON CONVEYOR, of screw type by Link-Belt, delivers sludge cake to lime kiln

Fig. 6b—CHAIN SECTION of the Smidth Kiln serves as heat recuperator at wet end

Fig. 6c—UNAX COOLER at lime discharge end of kiln

Fig. 7a—CO_2 COMPRESSORS of Nash-Hytor design recover byproduct carbon dioxide in stack gas for re-use in water re-carbonation

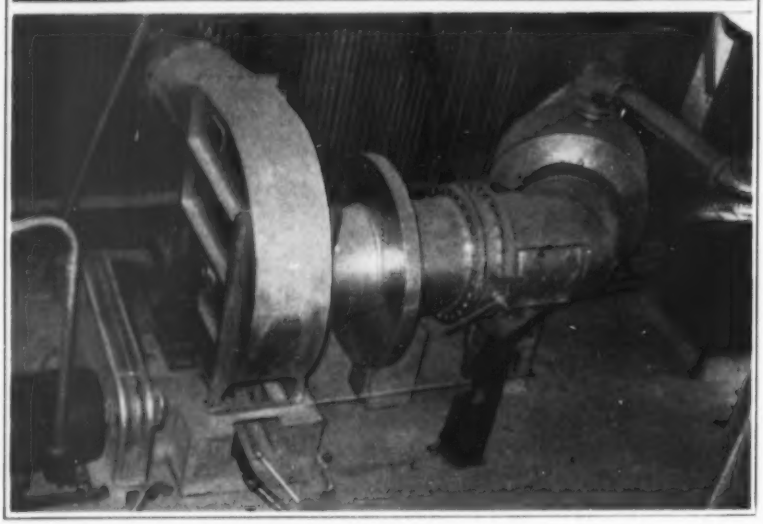


Fig. 7b—DRAFT FAN and butterfly damper valve which is so important in efficiency control in kiln operation

munication system is provided between the Discharge Building and the Feed Building.

Lime Transport and Storage

A Fuller Airveyor System, rated at 10 tons per hour, moves the lime from the storage silo to the 100-ton capacity bins in the chemical house—600 feet distant—and to an 80-ton auxiliary silo used for loading trucks and freight cars; a Roots-Connersville exhauster in the basement of the chemical house and an auxiliary blower in the pit beneath the main storage silo furnish the high velocity air for conveying the lime; a filter-receiver is mounted on the roof of the chemical house; a reversible screw conveyor is used to deliver lime from the filter-receiver to the lime storage bins above the gravimetric feeders in the chemical house. The pneumatic conveyor system is also used to deliver sodium silico fluoride from the treatment plant warehouse to a five-ton steel storage bin in the chemical house.

Operating Difficulties and Their Correction

Numerous difficulties were encountered during the early months of operation, most of them due to inexperience of the personnel. One, which on more than one occasion carried threats of throwing the writer in jail, brought about the erection of a considerably higher waste-gas stack. The trouble was the creation of an odor nuisance caused by the emission of hydrogen sulphide from the low stack. Improper combustion of the fuel oil proved to be responsible for the hydrogen sulphide. As the operators gained experience this trouble was overcome, but the higher waste-gas stack stands us in good stead because of the nearby residences.

Fire-rings that formed at the forward end of the kiln forced the shutdown of the plant a number of times during the first six months of operation. It was decided that the type of flame produced by the oil burner was the cause for these rings. By using a smaller atomizing nozzle and increasing the temperature and pressure of the oil, a flame was introduced which created a longer zone of calcining temperatures in the kiln and eliminated ninety per cent of the ring formation.

The storage silo was originally designed to hold 400 tons of quicklime, the designers figuring the weight of lime per cubic foot to be approximately 55 pounds. It was soon discovered that "Miami Lime" averaged only 40 pounds per cubic foot, weighing as low as 35 pounds when light-burned and 45 pounds when hard-burned. This reduced the capacity of the main silo to approximately 300 tons and the two 100-ton bins in the chemical house to about 73 tons each. Such reduced capacity did not provide a sufficient factor of safety when maintenance or repair shut-downs of the Lime Plant for as long as seven to ten days occurred. An additional height of 16 feet was added to the silo after it was determined that the bottom plates would take the increased load when stiffened with vertical angles. The change also necessitated an increase of 16 feet in the height of the bucket elevator. The cost of these changes was $11,660, as earlier noted under "Costs."

Excessive wear in the two 600-gpm

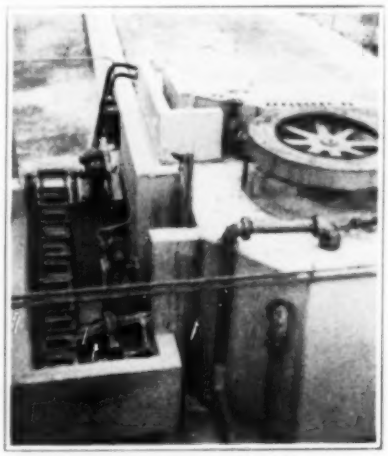


Fig. 8—VIBRATING SCREEN and flight conveyor by Link-Belt

Provided to clear old lagooned softening sludge of roots and other trouble making foreign materials—an afterthought.

vertical submerged sump pumps, due to the abrasiveness of the calcium carbonate solids, necessitated their frequent removal and final rebuilding with clear-water lubricated, rubber bearings, special steel bowls and closed impellers. Later, a gasoline-driven horizontal pump, 800-gpm capacity, was installed as an auxiliary. These changes called for an expenditure of $2,958.

During the first year or more of operation little or no make-up sludge was required, but in mid 1950 the three-drum tugger hoist and scraper were erected on a dumping tipple at the lagoon. The hoist and scraper had been bought as part of the original plant equipment; the installation cost was $4,009. The lagoon, over a period of 15 years, had become overgrown with Australian pines and weeds. Roots that were carried over into the washmill with the carbonate sludge passed on to the sludge pump, where they balled up and clogged, so that it became necessary to open the unit several times a day for cleaning. Some of the smaller roots passed on to the high speed centrifugal filter, where they lodged in the ports and unbalanced the spinner cone. After considerable study, a Link-Belt vibrating screen was installed; the screen discharges to a scraper flight conveyor which delivers the waste material into a wheelbarrow outside the pit (Fig. 8). Roots are now adequately removed; but a new problem has developed. A large number of hard calcium carbonate lumps, from pea to egg size, which formerly were crushed while passing through the Wilfley sand pumps—used as sludge pumps—are now being discharged on the flight conveyor. This problem has yet to be solved.

After the screen had been put in operation it was found that, in order to prevent flooding, the slurry level in the pit had to be kept so low that the positive head on the sand pump was lost. This started a search for a pump which would fit the new low head conditions. A Moyno Pump was purchased and installed, and it is handling the sludge satisfactorily. Expenditures for screen, conveyor, structural changes, pump and installation totalled $5,839.

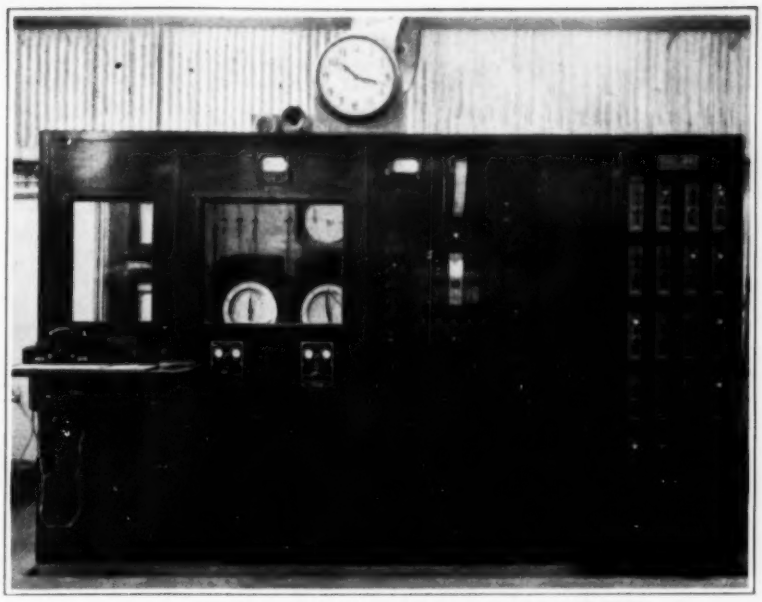


Fig. 9—CENTRAL CONTROL station panel in Discharge Building

Incorporated are recording pyrometers; carbon dioxide and oxygen recorders; oil pressure, flow and temperature recorders; air-operated combustion control unit; draft gages; various warning alarms, etc.

Numerous other minor changes have been made; such as a change in piping to permit wastes from the sump to be returned to the water treatment plant inlet, a housing enclosure around the main motor and auxiliary gasoline drive for the kiln, etc.

Maintenance

Practically all maintenance, including relining of the kiln, is done by the regular lime plant personnel, with assistance at times by mechanics from the water softening plant. The first 20 feet of the firing end of the kiln has been relined twice; quarter sections and keys have been replaced in other portions of the kiln; but no full relining job has yet been necessary. The increase in maintenance costs indicated in Table I for the fiscal year 1951-52 was due primarily to a main kiln bearing failure which required the jacking-up of the firing end of the kiln, the removal of two four-ton rollers, and the fabricating of new bearings by a local foundry. We believe that our maintenance costs have been nominal. Spare parts for most of the units of equipment are kept on hand but, unfortunately, spare kiln bearings were not on hand when the above-mentioned trouble developed.

Conclusion

The results obtained with the lime calcining plant have been most satisfactory and show conclusively that under conditions similar to those that prevail in Miami a worthwhile saving in cost of water treatment is being effected by using such reclaimed lime.

Mr. W. A. Glass is Director of the Department of Water and Sewers. The Lime Plant is under the general supervision of the writer, with Guy C. Collins as superintendent at the plant. Max Greitzer, mechanical engineer for the Department, designed and supervised the installation of the additional equipment enumerated under "Operating Difficulties."

Two's A Water District According to Law

The proposed formation of water and sewer districts in a 150-acre tract of the northeast corner of Mercer Island, near Seattle, Wash., was reported in *The Seattle Times* thus:

Asked by Board Chairman James A. Gibbs how many families were involved in the proposed water district, a spokesman for the proposal answered:

"Two."

"Two?" said Gibbs incredulously. "Can two people start a water district?"

"When they comprise 100 per cent of the property owners living within the proposed district," volunteered Ralph Stender, clerk of the board.

"This is just a start," explained a spokesman. Our hope is eventually to take in all of Mercer Island."

Stender explained that, in areas where large tracts of land are undeveloped, contractors or property owners sometimes form water and sewer districts before the development. Then, after homes have been built on the development, the cost of the improvements is charged to home owners.

Operation of Small Water Works

Public Relations*

by A. E. CLARK, *Manager, Nashville Suburban Utility District, Nashville, Tenn.*

THE term 'Public Relations" is one which is heard very frequently. It not only applies to public utilities but is equally important to private industry and commercial establishments of all kinds. In a municipally owned utility why should it be necessary to maintain good public relations with the consumer? The municipality fears no competition and for the most part rates are set by the local governing body without the necessity of securing the approval of any regulatory board. The answer is that the support of the consumers, regardless of ownership or regulation, is most important to the successful operation of any utility. This has been amply demonstrated.

The function of a water utility is to furnish an adequate quantity of potable water at all times, as well as service to maintain it. In order to do this the rates must be sufficient to provide the above service and since the consumer pays the bill every effort should be made to acquaint him with the facts regarding the production, distribution, operation and maintainence of the water system.

The knowledge which the consumer has of a water system is very meagre and little interest or thought is given to it unless he receives a high bill or is without water or it is turbid or has a noticeable odor. There is not any question regarding the duty of the utility to provide the consumer with the best possible service. Then, it is also its duty to justify the costs of providing it so that the well-informed citizen will brag on the system rather than condemn it, as many are wont to do.

Use Your Opportunities to Make Friends

The contacts of the public with the personnel of the water utility are limited, usually to paying the bill or possibly a telephone conversation relative to some service, or making a complaint. His opinion of the utility, therefore, is influenced by the above contacts. Under these conditions every effort should be made to show the customer that he can always expect courteous treatment. If he makes a complaint about his high water bill something should be done to convince him that he used the water for which he was billed or if an error was made in reading the meter, this should be explained and an adjustment made. He might have turbid water due to a main break or other cause. Merely telling him that if he is patient it will gradually clear up doesn't create a very good impression. If he is told that the trouble will be checked immediately and everything possible done to clear it up in the shortest possible time, he feels that the utility is interested in his problem and tends to make for a more favorable opinion.

*This is one of a series of articles by Mr. Clark, dealing with various problems in the day-in-and-day-out "Operation of Small Water Works." His next article will deal with that all too familiar topic "Getting Out of a Jam."—Ed.

How Far to Go?

There are certain services which the water utility must provide; but, there are many that some customers think the utility should give that are not its function. Normally the water utility is responsible for the service through the meter. From that point on it becomes the responsibility of the consumer. Even though the meter is the dividing line between the utility and consumer other services can be given which create good public relations at little expense. As an example, the consumer receives a water bill say twice his normal bill. According to his story he has been using water within reasonable limits the same as in previous billing periods. It is justifiable for him to question his bill and it is also the duty of the utility to assist him in locating his trouble if he has any. A check of the premises can be made for leaks, the meter can be reread, the tell-all "Meter-Master" can be installed and finally, if there is any further question after doing the above the meter can be tested for accuracy in the customer's presence. Additional expense? Yes, but if the consumer can be convinced that every effort is being made to help him doesn't it follow that he will have a better feeling toward the utility. If on the other hand when he questions his bill he is told that "meters never run fast" and there is nothing further the utility can do; or, if he is told to get a plumber and let him check around, does this improve relations? Mistakes are made, and suppose the meter was over read, true it will correct itself on the next reading, but the customer has the feeling that his interests are not considered.

The average consumer has little knowledge of piping, faucets, heaters, automatic clothes washers, etc. As long as everything works when he turns a valve or opens a faucet, fine, but suppose his hot water heater starts giving trouble such as over-heating and forcing hot water into the cold water lines. He calls the water utility and wants to know what the trouble is. It is easy to tell him to pull the switch if electric heated or turn off the gas, if gas heated, and call the electric or gas utility for service. Something may happen to a faucet where it cannot be closed and he doesn't know where his house shut off is located; he calls the water utility. Is he told that he will have to find a plumber to even get the water stopped? This doesn't create good public relations. If an employee is sent there in a reasonable time to either help him find the house shut off or turn the water off at the meter doesn't it give him a feeling of confidence in the utility that is willing and ready to help him. It doesn't mean that his faucet or whatever the trouble might be is going to be repaired by the utility, but after the water is shut off he can then get someone to make the necessary repairs. Suppose something of this nature happens at say 10 o'clock at night. Does he know, or can he find out readily how to call the water utility? He should be able to locate someone by telephone at anytime—day or night. This can be done by showing a number or numbers to be called nights, Sundays and holidays

under the number for the office that is shown in the telephone directory. The special numbers can also be shown on the water bill along with the office hours. This works two ways because, aside from calls regarding his troubles, he will also call about the utility troubles such as a broken main, leaking meters, etc.

Many houses having water services installed say twenty years ago have very low volume so that when one faucet is open no water is available in the other parts of the house. Some consumers will continue using water under these conditions until such time as a sufficient supply at one faucet is not available. The water utility is called regarding the condition. He can be told that he can call his plumber if he wants to or he can also be told that a pressure and flow test will be made at the meter and the house to determine what his trouble is and what steps are necessary to correct it. If the utility owns the service and meter and it is found that the connection between the main and meter is responsible for part of the trouble, this can be corrected by the utility at its expense. If the line from the meter to the house is also giving trouble, this, of course, becomes an expense of the customer which he will well understand if adequately explained. However, if the low volume condition is cleared up and he gets a good volume of water at all times, he will appreciate the help given through the services of the utility.

Good Service is Worth What it Costs

The above are a few examples of creating good public relations through actual service to the individual customer. How are all of the consumers to know about the services and improvements made that will directly or indirectly be of benefit to them? He doesn't consider an increase in water rates a benefit, however, if handled in the right way and under certain conditions he will know that he is paying for better service or improved water. Say, for instance, that the only available supply is relatively hard and creates troubles attributable to hard waters. In order to furnish a soft water it means additional production expenses. Proper publicity will usually convince the majority of the customers that an increase in water rates is justified if a soft water is furnished with its attendant benefits. Additional storage and larger feeder mains may be required to provide satisfactory service. The benefits when explained in the right way will most generally show the consumers that an increase in rates is necessary to care of the debt service incurred by these improvements.

Sewer Service Charges and the Water Utility

A number of municipal utilities are resorting to increased water rates for the purpose of providing sewerage. This method of collecting the necessary funds for the purpose is open to argument. There is not any question that if a municipality desires to install a sewage disposal plant it must be paid for by the residents of the city including those who will be indirectly benefited by the improvement. Financing can be done by the issuance of revenue bonds or general obligation bonds. Assuming that the municipality furnishes water outside the corporate limits, should those consumers help pay the cost of the disposal plant if they do not directly benefit from it or if there is a thought that sometime in the distant future sewers may be extended to those areas. There is a doubt regarding the imposition of an additional amount to his water bill at this time when in general he is paying from 50 to 100 per cent more for his water than those living within the corporate limits. If revenue bonds are issued and the cost assessed against the water consumers what about the vacant property as yet not developed inside the city which would benefit indirectly by the installation of sewerage facilities? The generally accepted principle in this regard is that those directly and indirectly benefited should pay their proportionate share of this expense. This could be accomplished better by the issuance of general obligation bonds because then everyone benefited would pay his share. A case in point has arisen which throws some light on this subject of public relations. This is where the water bills were increased 50 percent both inside and outside the city to pay for a sewage disposal plant, based on the issuance of revenue bonds. The rate went into effect in the late spring and of course during the summer the increase was felt very noticeably. This led to an investigation of the method of financing the improvement as well as the necessity of the 50 percent increase. A more thorough study in the revision of the rate structure, and possibly the method of financing, might have saved the municipality severe criticism and possibly a readjustment of the rates and method of financing.

Newspaper publicity, radio and T.V., items on the bills, printed material addressed to the consumers are some of the methods used for making good public relations by informing the public whenever improvements are being made, and how it will help water users. Tell the customer what he is paying for when he pays his water bill, and also impress on him that he is purchasing water and service cheaper than any other commodity in the market today.

The general public seems to think that water and service should be practically free since they think all that is necessary is to get the water in the mains and from there on it takes care of itself. They apparently know little if anything about pumping, purification, storage and fire protection. Why not tell the public about it and if possible get them to see for themselves just how big a business their water utility is. Tell them just how much is being done all the time to assure them of an adequate supply of water at all times. Water utilities are prone to rest on their laurels by providing the above services and thinking the general public will somehow know what is being done for them. Such is not the case because they do not know.

And So—

Striving for good public relations promotes an interest in the water utility and many times this same interest redounds to the benefit of the utility through various avenues. The margin between good and bad public relations in utility service is thin. It costs but little more in the long run to insure that a utilities relations are put and kept on the GOOD side. No water utility is too small to benefit from any attempt made to better its standing in the community.

J. Arthur Carr is Dead

J. Arthur Carr, Superintendent of the Ridgewood, N.J., water department since it was formed in 1914, died on January 31st. He was 63 years of age.

Mr. Carr had been a director of The American Water Works Assn., and in 1914 received the Association's George W. Fuller Award. He served in World War I with the Sixty-Ninth Observation Balloon Company in France.

Dechlorination Linked to Corrosion in Water Distribution Systems

Ferrous Iron Pick-up Seemingly Accounts for Loss of Chlorine Residuals

by DON B. WILLIAMS, *In Charge of Purification, Brantford Water Works, Brantford, Ontario*

For many years, investigators have sought to explain the loss of chlorine and chloramine residuals in water distribution systems. Mr. Williams has conceived what he terms an amazingly simple answer to this problem. He finds the reduction of residual chlorine and chloramines is related to the increase in ferrous iron content of water caused by corrosion—and he demonstrates the significance of this relationship. His paper may well represent a distinct contribution to the art and science of water chlorination practice.

IT is entirely possible to produce *at the water plant* a finished water quite acceptable from the taste and odor standpoint, even when these characteristics are unsatisfactory in the raw water. The phrase *"at the water plant"* is purposely emphasized because, at Brantford, we find when we produce an acceptable water at the plant it will persist throughout that proportion of the distribution system classed by the author as "high flow areas." However, we often find in "low flow areas" and in "dead ends" that the water quality is anything but acceptable, and often may be worse than the raw water as far as tastes and odors are concerned.

It is apparent that while an acceptable water is produced at the plant some change in quality takes place by the time it reaches a consumer located on a dead end or in a low flow area. As the consumers in these areas are estimated by the author to represent 30 per cent or more of the consuming public, we perceive the problem involved is one of some magnitude. The author has previously suggested that one of the greatest responsibilities of those charged with the control of water treatment is that of maintaining the finished water in a satisfactory condition throughout the distribution system.

Free Residual Chlorination —Early Problems

At Brantford, late in 1947, we started to apply free residual chlorination for the purpose of eliminating tastes and odors from the raw water, particularly those of the phenolic type. We hoped to produce a finished water containing a free chlorine residual which would persist relatively undiminished throughout the distribution system. In high flow areas this treatment resulted in water of the same quality as the finished water leaving the plant, but there still remained the dead ends and areas of low flow where conditions were not improved (and where they never had been good).

Finally, early in 1948, there developed in the raw water a condition which caused us to stop sending out a high free chlorine residual; it required us to dechlorinate to an almost zero residual—because the treatment had resulted in generating[1] nitrogen trichloride (NCl_3). The change in treatment eliminated complaints due to the presence of NCl_3. Soon, however, we noted that with little or no outgoing residual chlorine the water in dead ends became worse, and the areas of low flow were increasing. Maintaining virtually zero residual chlorine in the water leaving the plant was still an unsatisfactory answer.

Late in 1948 a procedure was adopted[1, 2] that permitted us to continue with free residual chlorination, as a part of the treatment regimen followed at the plant, and also to send out a chloramine residual. Then we were on easy street, it seemed, because we had long been told of the stability of chloramines. Sending out a chloramine residual in the finished water almost immediately did reclaim the "lost" areas; i.e., those areas which had deteriorated during the period of dechlorination to almost a zero residual. This improvement encouraged us, since we assumed that the chloramine residual would continue to spread out gradually until it persisted to the utmost of dead ends. The reason for this article is that the chloramine residual *did not persist* as we had assumed it would.

Chlorine vs. Chloramine Residuals

During this period the author gave consideration to arguments concerning the relative stability of free chlorine residuals versus combined chlorine residuals (chloramine), definite camps of thought on this point apparently having been established. Not belonging to either camp, it became apparent to the author that in the absence of "organic nitrogenous matter" free chlorine and chloramine residuals were equally stable, all other conditions being equal.

The author was able to show the relative stability of *free chlorine* residuals to be dependent on the presence or absence of varying amounts of protein matter, and that such protein matter had no effect on the stability of *chloramine* residuals.[3] (In this discussion "protein" is used to indicate those organic nitrogenous substances which may be entirely amino acids, entirely proteins, or any combination of the two.)

The $64 Question

A very irksome question then arose: if chloramine residuals are not affected by protein matter, why is it that samples of water containing chloramines show residuals to be stable for several days when held in the laboratory—but the chloramine residual is very much reduced in amount when it travels some 3 miles in the distribution system in a time of only two hours?

In assessing this question it is important to realize that the water samples containing chloramine would be stored in the laboratory in glass containers and would be kept in the dark. All samples soon would have a temperature of 70 to 80°F, dependent on natural summer temperature or winter indoor heating conditions. These samples were found to have relatively uniform chloramine resid-

ual stability regardless of temperature, but the same conditions did not apply in the distribution system. The stability of a chloramine residual in the distribution system was not as good in summer as it was in winter, all other conditions excepting the temperature being equal. Thus, whatever affected the stability of the residual was influenced by temperature.

Ammonia Under Suspicion

At this point of the investigation, W. G. Woxholt, Chief Chemist of The Rand Water Board, South Africa, visited the Brantford Plant. He also expressed concern over maintaining the stability of residuals. Of great importance to us was the fact that he had observed a decrease in ammonia content of water as it travelled through the Rand distribution system. The Rand Water Board's system is apparently unique in that it extends for several hundred miles between purification plant and ultimate consumer, often covering more than a hundred miles between pumping stations. The Rand Board distributes water from one source to an area in excess of 4,000 square miles. Here indeed is a large scale demonstration of unexplained drop in ammonia content as water passes through a distribution system.

The same loss of ammonia was noted at Brantford. At times, the ammonia content of the water, after 3 miles travel in the distribution system (approximately two hours), is reduced by two-thirds. The ammonia content of samples of the same water stored in the laboratory remains unchanged for days.

Chloramine—Two Forms

Also at this time Palin[4] reported chloramine residuals generally are composed mainly of monochloramine at the treatment plant, but that there is likelihood of a change taking place in the distribution system—possibly favoring the formation of dichloramine. This he considered, might be the result of a catalytic effect; metals, for example, being the cause.

Marks, Williams and Glascow[5, 6] were able to show, at Brantford, that there is a definite change from a high percentage of monochloramine and low percentage of dichloramine in the finished water. The change, out in the distribution system is to a low percentage of monochloramine (or its complete absence) and a higher percentage of dichloramine. These authors considered this phenomena, theorized by Palin in England and demonstrated at Brantford, to be associated with the mysterious partial disappearance of ammonia which would favor a shift from the monochloramine to the dichloramine form. It was also felt that, more likely, there is no such shift—instead the monochloramine (being the more reactive form) is used up more rapidly and thus accounts for the change in the chloramine ratio.

Dichloramine is more noticeable as a taste than is monochloramine; therefore, from a taste standpoint, it is desirable to prevent the drop off in ammonia content so as to favor the presence of monochloramine. The author theorized, as others have done, that slime growths, molds, bacteria or other forms of life live in and adhere to the inside of water piping. These must be capable of living in the presence of chloramine residuals of 0.3 to 0.6 ppm and, more important, may be capable of utilizing as food material some of the ammonia so necessary to the stability of the chloramine residuals. This reasoning was strengthened by the author observing forms of life existing in chloramine solutions containing more than 0.3 to 0.6 ppm chloramine. Even strong solutions of cyanide and phenol are known to be eventually broken down by certain bacteria when such solutions are deposited in soil.

What could be done to destroy these forms of life without endangering or annoying the water consumers? That seemed to be the next question to investigate.

Copper Investigated

The work of Amsbary[7], at Champaign, Ill., and Smith[8], at Richmond, Va., in applying copper appeared to suggest an answer. We hopefully expected that the copper would kill off that which was destroying the ammonia, and thus result in increased chloramine stability.

Prior to applying copper we increased the number of samples taken from various parts of the distribution system for chemical observation. These samples were examined for monochloramine and dichloramine content by the Amperometric method[9], for free ammonia, and for nitrites. Occasional samples were checked for total organic nitrogen (protein), pH, and alkalinity. All observations on samples taken from the distribution system were compared with similar observations on samples taken at the plant the same day. On the spot taste tests were also made.

From these observations made prior to the addition of copper we can state:

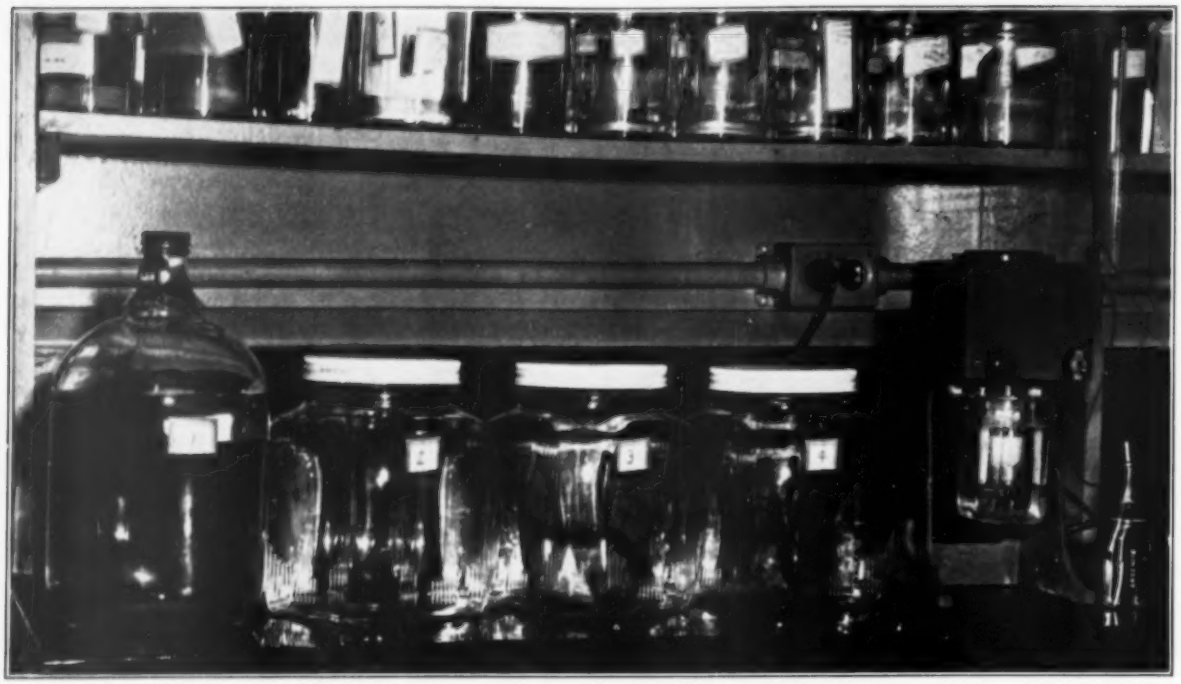
(1) The pH, alkalinity and total organic nitrogen content of the water remained unchanged throughout the system.

(2) Nitrite never was found in the plant effluent or at any point in the system where a measurable chloramine residual existed. Nitrite occasionally was found at points where a chloramine residual could not be detected, but the nitrite (when present) existed only as a barely dectectable trace. Further, the presence or absence of such a trace of nitrite did not show any relation to the ammonia content.

(3) The chloramine residual, as always, diminished from a residual that was predominantly monochloramine to a residual of lesser magnitude in which dichloramine predominated.

(4) Only one important chemical observation resulted from these studies: the ammonia content *did not* always drop off. Our previous observations (smaller in number) apparently had been made on those occasions when the ammonia content

MODERN and well-equipped laboratory of the Brantford Water Works



JAR TEST demonstration of dechlorination—the set up described in text

Samples of chlorinated water: No. 1 for immediate analysis; No. 2 held for 24 hours; No. 3 contains cement asbestos pipe; and No. 4 contains iron pipe Right: Amperometric Titrator for residual chlorine determination

did drop off 50 to 70 per cent. The new and greater number of observations were made both on occasions when the ammonia did drop off and at times when it remained absolutely unchanged. At this time we can offer no explanation for the behavior of ammonia.

(5) Regarding taste: wherever any residual was found, the taste of the water would be as good as of that leaving the plant. Where a residual was not found, either one of two taste conditions or a combination of both existed. One taste condition we describe as phenolic but it is more reminiscent of the odor of shoe polish. The other is best described as a bitter, irony taste.

Chloramine and Pipe Samples

Coincident with these observations of distribution system samples, in the period prior to the application of copper, an attempt was made to discover by means of laboratory experiments just what happens to chloramine and ammonia in the presence of samples of pipe. A large sample of water was divided into four portions:

No. 1 portion, as the control, was immediately analyzed for free ammonia, monochloramine and dichloramine, and total organic nitrogen.

No. 2 portion was placed in a clean large mouth screw cap jar, of approx. one Imp. Gal. capacity, and stored in the dark.

No. 3 portion was treated the same as No. 2, except that the jar contained a short length of asbestos cement pipe—a 6 in. length of 4 in. diameter pipe.

No. 4 portion was treated the same as No. 3 except that the pipe sample was of iron. A piece of partially rusted pipe was chosen to simulate as nearly as possible the inside of our distribution system.

To rule out the possible activity of slime growths, bacteria, etc., the sample of iron pipe was removed from a point in the piping system where it had been subjected to contact for months with water containing a high concentration of free residual chlorine. In addition, the pipe was sterilized by heat prior to use in this experiment. If this piece of pipe had no effect on the ammonia or the chloramines, we planned to remove a piece of pipe from the distribution system. This would enable us to judge first the action of iron pipe and, secondly, the action of iron pipe plus slime growths etc.

The results of analyses made at the end of 24 hours are of interest:

In the No. 2 portion, the otherwise empty jar, no change occurred except the normal small 24-hour drop in total chloramine. The ammonia and protein contents remained unchanged.

In No. 3 portion, containing the asbestos-cement pipe, conditions duplicated those in No. 2 portion: virtually nothing had taken place.

In No. 4 portion, containing the iron pipe, the ammonia and protein contents remained unchanged—but all trace of a chloramine residual had disappeared. Repetitions of this experiment showed that the chloramine residual disappears in about 15 hours. The ammonia content was the same, but the chloramine no longer existed. Further, the water had developed both a rusty appearance and a bitter irony taste.

The results of this experiment should have given us the answer. We did not appreciate its significance since we still were looking for some obscure form of "life" as the cause of chloramine instability.

Plant Use of Copper

We then started to apply sufficient copper sulphate in the plant to provide a dose of 0.1 to 0.2 ppm as copper, attempting thereby to simulate the treatment used at Richmond, Va.

Observations on the distribution system were continued as before. We hoped particularly to find indications of greater chloramine stability. From the chemical standpoint, nothing happened. Our findings in regard to free ammonia, protein content, and chloramine residuals remained exactly as

before. Obviously whatever was destroying our chloramine residuals was not prevented in doing so by the added copper.

The copper application has been of real value, however, because it has improved those distribution system areas in which we were troubled with the aforementioned phenolic type of taste. While this type of taste also has disappeared from the dead ends, a flat, decidedly unpalatable "irony" taste remains. We feel that the irony taste was probably always present but was masked by the phenolic type taste.

At this point we still did not have an answer to the problem of chloramine instability. The application of the copper should not confuse the issue, since it is incidental to the main theme, but this treatment did make us start to look for ferrous iron in the water in the distribution system.

Ferrous Iron Implicated

The reason we checked for ferrous iron is that, since iron does replace copper from solutions of copper salts, we suspected that iron might be going into solution and the copper plating out. The copper was apparently not being plated out, as we found the copper content undiminished throughout the system; further, the copper content at no time matched the ferrous iron content found at the dead ends. Copper, therefore, can be dismissed from these considerations.

Our analyses showed the water to contain ferrous iron in varying amounts, ranging from zero at the plant to as high as 0.8 ppm at an extreme dead end.

It is apparent that we have a slightly corrosive condition, not enough to show as a change in pH or alkalinity as the water travels through the system. Nevertheless, there is a gradual increase in ferrous iron, starting with zero ferrous iron at the plant and averaging in the 0.25 to 0.50 ppm range in the dead ends and areas of low flow. Cox[3] adequately describes the action by which metallic iron from piping may enter the water as ferrous iron in solution. We believe ferrous iron to be present in our system as ferrous bicarbonate.

The author then noted that the disappearance of chloramine was proportional to the increase in ferrous iron content as the water progressed through the system. There is no ferrous iron in the water as it leaves the plant with a considerable chloramine residual; a little way out in the system, there is a smaller chloramine residual plus a ferrous iron content of 0.08 ppm; out in a dead end or low flow area there is no chloramine residual but a ferrous iron content of 0.25 ppm or more. The observations have been sufficiently repeated so that one can estimate fairly closely the magnitude of the ferrous iron content from a chloramine determination, or vice versa.

Ferrous Iron Dechlorinates

The answer is quite simple: the instability of chloramines is caused by a greater or lesser degree of corrosion which permits ferrous iron to enter the water, and the ferrous iron is a dechlorinant. Conversely, one can say that chloramine being an oxidant is using itself up in attempting to oxidize progressively greater amounts of ferrous iron as it passes through the system. In this regard it should be recalled that the dechlorinating property of ferrous sulfate has often been noted in water works practice, whereas the opposite effect is made use of when chlorine is used to oxidize ferrous sulfate to the ferric state for preparing a coagulant.

The loss of chloramine residual which took place in the jar containing water and a piece of iron pipe is explained by the fact that some of the iron went into solution as ferrous iron and this resulted in rapid dechlorination of the chloramine. There were no slime growths, molds, bacteria or other forms of life involved—just ferrous iron. Palin[4] theorized very close to the truth in stating: "Where ammonia is always in excess of chlorine as in the chloramine treatment of water, the product, in neutral solution, consists almost entirely of monochloramine. The possibility of changes taking place later in the water distribution systems should not be overlooked. Metals for instance, might have catalytic influence." As we have seen the metal iron in the ferrous state does have a decided influence but the action appears to be direct chemical reaction rather than a catalytic effect.

Ferric iron plays no part in this undesirable reaction but is rather one end product of the reaction. Ferric iron which originally may be present in water does not act as a dechlorinant; this is as one would expect, because the ferric iron already is in its highest state of oxidation.

The reaction of ferrous iron and ferric iron with a chloramine residual were next examined by the author, employing an Amperometric Titrator, in the following manner and with the following results:

A sample of water containing a chloramine residual was divided into three portions, the first portion being examined in the Titrator for monochloramine and dichloramine[5].

After flushing out the Titrator cell and preparing the second portion for titration, 0.01 gram of C.P. ferric sulfate was dropped into the sample prior to the KI addition and titration. After a half minute of stirring, the titration was made. On finding the second sample to contain the same amount of monochloramine and dichloramine as did the first sample, one can state that the ferric iron did not act as a dechlorinant.

In the examination of the third portion, 0.01 gram of ferrous sulfate was added and stirred for a half minute. On the later addition of KI no needle swing took place. Thus, no titration could be made because all chloramine residual had been destroyed by the ferrous iron.

This experiment has also been repeated with samples containing residuals of free chlorine instead of chloramine and the results have been the same. Therefore, in distribution systems containing free chlorine residuals one would expect ferrous iron to dechlorinate such residuals.

It is suggested that only the Amperometric Titrator be used in repeating these experiments. While it is conceivable that orthotolidine could be used to demonstrate the above facts, it should be realized that ferric iron may produce interference with the orthotolidine test and obscure results. There is no interference in the case of the Titrator.

Many Questions Answered by This New Concept

The concept that it is ferrous iron in solution which destroys chloramine residuals (and free chlorine residuals) explains several points previously obscure:

(1) We had considered that there was a "shift" from monochloramine to dichloramine when a chloramine residual composed of 80 per cent monochlaramine and 20 per cent dichloramine became considerably reduced in total chloramine content, the ratio of monochloramine to dichloramine changed until the dichloramine represented more than 50 per cent of the total.

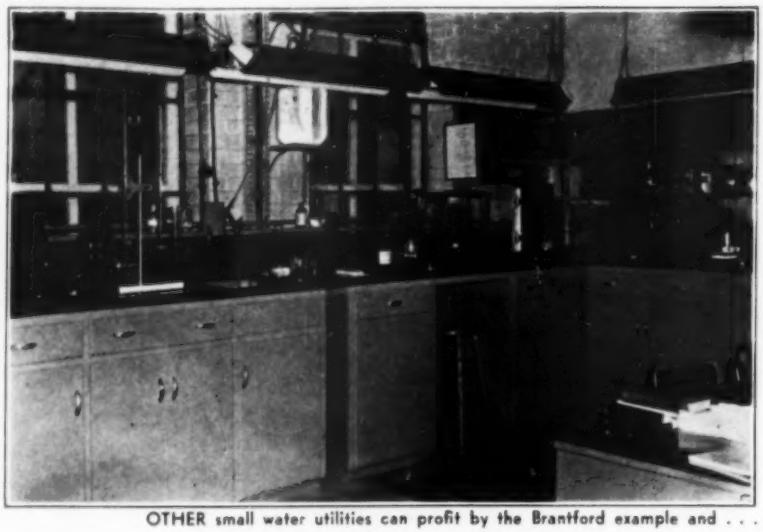
[We did feel that this shift might be due to loss of ammonia from the system, an effect that would favor a predominance of dichloramine; but it was considered more probable that there was no conversion of monochloramine to dichloramine due to lack of ammonia—rather the monochloramine being the more reactive is consumed more rapidly. At times, however, no loss of ammonia occurred. When it is realized that at all times ammonia was in excess, the "shift effect" was without explana-

tion. We find the theory of the greater activity of the monochloramine is the true explanation. Monochloramine, being more reactive is destroyed more readily; whereas dichloramine being less active is not so readily destroyed, and therefore persists farther out in the system. The relative activity of these two chloramines can be recognized in reviewing Palin's F.A.S. procedure, and the amperometric procedure of Marks, Williams and Glascow. In these methods it is observed that monochloramine, being quite active, is readily titrated; whereas the dichloramine, being less active, requires the addition of potassium iodide and the effect of buffer action to be brought into suitable activity.]

(2) In regard to temperature effect: we had always noted that, in the laboratory, warm temperatures did not appreciably influence the stability of chloramine residuals. When water samples are stored in glass there is nothing present for these residuals to react with. There is a greater loss of residuals in the distribution system in summer than there is in winter; we attributed this condition to the warm temperatures encouraging a greater growth of the "life" that we suspected was attacking residuals through theft of ammonia. The actual explanation is that chemical reactions are favored by an increase in temperature. Thus, a water temperature of 87°F is more favorable to the reaction between ferrous iron and chloramines than is a water temperature of 32.5°F, and hence the more rapid disappearance of residuals in summer.

(3) We have long known the continued presence of a chloramine residual would assure water of plant quality, whereas the absence of a residual coincided with a water that justified complaint. We now feel that complaints from the dead end locations have been due mainly to the bitter astringent effect on the palate of a small trace of ferrous iron. The explanation is that relatively no ferrous iron would be found where a residual could be detected because the chloramine residual would immediately oxidize any ferrous iron to the ferric state. Conversely, where no residual existed the ferrous iron would not be oxidized, and the content would increase to the point of producing an unpalatable water.

(4) A sudden flare-up in distribution taste problems has occurred during the period when dechlorination was carried to virtually zero residual, and at other times when an accidental excess of sulfur dioxide was used. This condition is now explained: there being no oxidizing residual present, the ferrous iron could develop and remain unchecked throughout the entire distribution system. As soon as a chloramine residual could be maintained or restored, then the taste troubles ceased in the high flow areas.



OTHER small water utilities can profit by the Brantford example and . . .

Corrective Measures

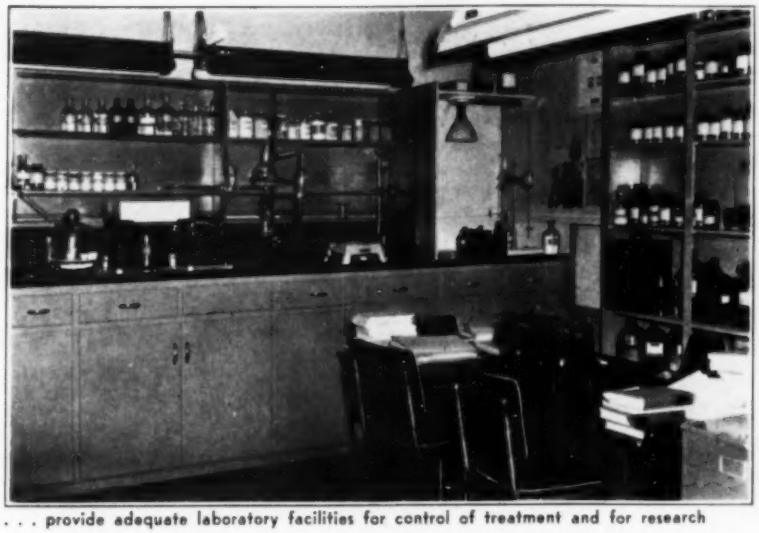
On the basis of the preceding discussion, it appears that the maintenance of water quality in the distribution system is dependent on the presence of a chlorine or chloramine residual. (The choice of residual will be determined by water conditions[2].) The question logically arises: "How can we prevent ferrous iron from dissolving in the water?"

We must stop not only gross and very obvious corrosion, but must stop all iron from going into solution (that is, even a very minor degree of corrosion). At Brantford, for example, the water is not normally classed as particularly corrosive. The author's house has been in existence for some 45 years, every inch of the original iron pipe plumbing is still in use, and does not now require replacing. At Brantford we do not receive complaints regarding iron stains on white porcelain plumbing fixtures. Furthermore, pH and alkalinity throughout the system show no change; "marble tests" shows only minor aggressiveness to calcium carbonate for a few periods during the year—for the greater part of the time the water is not aggressive to $CaCO_3$.

It will be apparent that, in discussing the small ferrous iron content of our water we are considering a level where very minor corrosion is going on. We are considering a degree of corrosion not easy to detect by the normal approach. The author suggests that in overcoming this problem, we shall require ferrous iron to be absent throughout the distribution system, and a stable chloramine (or chlorine) residual to be present.

What will answer to prevent ferrous iron from going into solution? Cement-asbestos pipe? This would provide a very good answer except that Harry E. Jordan has reported piping systems in existence to be predominantly cast iron pipe (more than 90 per cent). Most of these systems are good for at least another 50 years, and they represent too great a capital expenditure to call for scrapping. Even if present systems are outmoded on a diameter basis, the smaller piping will merely be reinstalled in outlying areas; therefore, as far as anyone can foresee, water distribution systems will continue to consist largely of iron pipe. Cement-asbestos pipe apparently would provide the answer for new systems—if it were not necessary to use cast iron tees, elbows, etc. A large cast iron tee might, through corrosion, produce all the ferrous iron necessary to bring about dechlorination as has been previously indicated.

What about coatings on pipe interiors? How good are the coatings of 20 to 30 years ago? They probably are not now on the inside of our pipes. Are the coatings of today any better than yesterday? Assuming that they are, what good will the finest coatings in the world be if, every time a service connection is made, the protective coating of the main is ruptured and torn off? Visualize the welder's torch burning and searing all coating within a foot of the cut, thus creating a focal point from which a veritable "measles" of corrosion can spread. Coatings are good, and even better



. . . provide adequate laboratory facilities for control of treatment and for research

ones will be devised, but for practical reasons we cannot expect a completely impervious coating to extend from the plant to the most distant faucet.

The final answer would seem to be found in the correct treatment of the water so as to prevent its aggressiveness toward iron. How we will accomplish this is dependent on various conditions. In certain instances, raising the pH by adding lime or soda ash will be all that is required to prevent dissolving of iron. Some plants will find it necessary to add lime plus one of the phosphates, or a phosphate alone. In still other instances, an added silicate with or without pH adjustment may provide the answer. In any event, the degree of success should be measured by the amount of ferrous iron found in the water in the distribution system and by an increased stability of chloramine residuals.

Footnotes

The author is fully cognizant of the fact that the relative stability of chloramine residuals differs with the pH value of the water and with the ammonia to chlorine ratio employed. In the Brantford system, the finished water has a pH range of 7.2 to 7.4, and an ammonia to chlorine ratio of 1 to 3 is employed in chloramine formation. No reference was made to these considerations because, in this system, one particular chloramine residual of known stability was under discussion. It should be noted that *all* chloramine residuals of greater or lesser stability will be dechlorinated by ferrous iron.

There is no intent to discredit the addition of copper to finished water. This is a treatment which has proved to be of some value in our system and of greater value elsewhere. It will always be desirable to use copper where conditions are such that its use is indicated. Copper has nothing to do with the ferrous iron-chloramine reaction, and the description of its use at Brantford is merely incidental to the main topic; reference to copper was included solely as a factor in our investigation.

Also there is no intent to discredit the important work of those who have demonstrated various forms of life to exist in some distribution systems. These forms of life may cause degradation of water quality, but apparently they are not involved in the dechlorination of a chloramine residual by ferrous iron. Dechlorination is the result of corrosion. By preventing the solution of ferrous iron we can reduce the destruction of chloramine and chlorine residuals. It appears to the author that the maintenance of residuals of increased stability would best eliminate biological forms from distribution systems.

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Edwin B. Cobb

John S. Bethel, Jr.

Cobb and Bethel Partners in Metcalf & Eddy

Metcalf & Eddy, consulting engineers, Boston, Mass., have announced that Edwin B. Cobb and John S. Bethel, Jr., who have been members of their staff for a number of years have been admitted to the firm as partners.

The partnership now consists of Frank A. Marston, Harrison P. Eddy, Jr., E. Sherman Chase, Frank L. Flood, Scott Keith, John W. Raymond, Jr., Russell J. Rice, Edwin B. Cobb, and John S. Bethel, Jr.

"Jim" Brower Retires

A pioneer in activated sludge plant operation at Milwaukee

James Brower, for the past 25 years superintendent of the Milwaukee Activated Sludge Plant, retired recently at the age of seventy.

A native of Holland, Jim Brower was the mechanical engineer who did as much or more than any other single man to work the kinks and headaches out of the Milwaukee Sewage Treatment Plant which was amongst the earliest to pioneer the activated sludge process and the production and marketing of prepared sludge fertilizer under the coined name "Milorganite."

Amongst the several improvements and innovations for which Brower has been responsible was the unique "Tow-Bro" Clarifier Mechanism of which he was co-inventor with Darwin Townsend, a former superintendent who later entered the consulting field.

We understand that Mr. Brower will now offer a consulting service founded on his long and varied experiences in connection with the Milwaukee plant. His chief interest will lie in the diagnosis and correction of mechanical and hydraulic trouble which continue to plague many sewage plants. His office is at 3021 North 36th St., Milwaukee, Wis.

New York Sewage and Wastes Assn. Holds 25th Annual Meeting

Two-day Session Emphasizes Operating Problems of Industrial and Municipal Plants

THE New York Sewage and Industrial Wastes Assn. celebrated its own twenty-fifth annual meeting only a few months after being host to the Silver Anniversary Meeting of the Federation in New York City. The New York Association met at the Hotel New Yorker on January 22-23, with a registration of 299. The spring meeting of the Association will be held in Rochester next June.

At the business meeting, reports of officers were received and members voted approval of certain changes drawn up to modernize the Association's contribution.

Luncheon Meeting

Guests at the luncheon meeting included LOUIS J. FONTENELLI, Vice President of the FS & IWA, and LT. COL. STANLEY WEIDENKOPF, M.S.C.

Mr. Fontenelli, Superv. Engr., Rahway Valley Ft. Meeting, Garwood, N.J., discussed Federation affairs—first expressing appreciation for the assistance and contributions of the New York Association at the Federation's record-breaking annual meeting. He reported a total membership of 5,450 and individual associations numbering 38 (of which 7 are outside the U.S.) now comprising the Federation. A new goal of 6,000 members has been set; meeting this will require an average 7 per cent increase in membership. The FS & IWA is making material contributions in its publications, in its stimulation of research, and in joint activities with other technical associations.

Lt. Col. Weidenkopf, recently returned from Korea, reported all the details of water supply and sanitation problems which could be described under security regulations. He discussed the transportation of an adequate water supply during military invasions, and the provision of safe supplies on land. Filtration in diatomite units and superchlorination are generally used. Control measures have kept rodent-borne diseases in check. Existing water treatment plants in conquered areas have been rehabilitated. The speaker mentioned that the almost universal sewage disposal practice of using night soil as fertilizer has kept the same ground productive for hundreds of years.

New Officers

President	Vice-Pres.	Exec. Secy.	Treasurer
Harry A. Faber	*W. L. Edwards*	*R. C. Sweeny*	*J. C. Brigham*
Assoc. Editor	*Sen. Plant Oper.*	*Dist. Engr.*	*Sen. San. Engr.*
Water & Sew. Wks.	*Gowanda State Hosp.*	*State Hl. Dept.*	*State Hl. Dept.*
New York, N.Y.	*Gowanda, N.Y.*	*White Plains, N.Y.*	*Albany, N.Y.*

Social Hour

The Social Hour, held at the end of the afternoon session during the first day of the meeting, is a regular and enjoyable feature. It is provided through the courtesy of the Water and Sewage Works Manufacturers Association, Inc.

New Officers

Elected to serve the New York Association for the coming year are the following officers:

President
Harry A. Faber
Assoc. Editor
Water & Sewage Works
New York, N.Y.

Vice President
William L. Edwards
Sen. Sew. Plant Operator
Gowanda State Hospital
Gowanda, N.Y.

Executive Secretary
R. C. Sweeny
District Engineer
State Health Dept.
White Plains, N.Y.

Treasurer
J. C. Brigham
Sen. San. Engineer
State Health Dept.
Albany, N.Y.

New Members, Executive Committee

Olney Borden, Consulting Engr., Liberty, N.Y.

Clifford E. Irving, Supt., Bur. of Sewage Treatment, Schenectady, N.Y.

William A. Sparks, Operator, Sewage Treatment Plant, Newark, N.Y.

Honors and Awards

Walter R. Schreiner, Retiring President of the Association, was presented with a certificate and the *Past President's Key*.

Anthony J. Fischer, Development Engr., The Doer Co., Stamford, Conn., was nominated to receive the *Bedell Award* for conspicuous service to the Association.

J. P. Horton, San. Engr., National Dairy Res. Labs., Oakdale, L.I., was selected as recipient of the *Kenneth Allen Award* for the best technical paper published in the Federation Journal.

Past Presidents

1952	1951
W. R. Schreiner	*John M. MacCrea*
Dist. Engr.	*Mfgr. Agent*
State Health Dept.	*Chicago Pump Co.*
Glens Falls, N.Y.	*Syracuse, N.Y.*

This paper was presented at the January 1952 meeting of the New York Association, under the title "Lethal Effects of Ultrasonic Vibrations in Sanitary Engineerinng Applications."

Messrs. D. E. Phinney and M. P. Horwood, co-authors of the paper, not members of the Association, will receive letters of commendation.

Technical Program

The technical program was presented in three sessions, the first of

which included two comprehensive papers and discussions. The second was devoted to a symposium on industrial wastes, and the third to an operators' symposium on sludge digestion.

Two excellent sound motion pictures were presented. *"Air, water and Industry"* was produced by the Dow Chemical Co. to illustrate the vital part played by these two raw materials in chemical industry. *"Pure Water"* was produced by the Dorr Co. of Holland as an educational film on the subject of modern sewage treatment processes.

Chairmen

Program	Arrangements
J. M. Brown, Jr.	*M. E. Ferguson*
San. Engr.	*Field Tech.*
Lederle Labs. Div.	*Int. San. Comm.*
Pearl River, N.Y.	*New York, N.Y.*

Award Winners

Bedell Award	Allen Award
A. J. Fischer	*J. P. Horton*
Devel. Engr.	*San. Engr.*
The Dorr Co.	*Natl. Dairy Labs.*
Stamford, Conn.	*Oakdale, L.I., N.Y.*

Activated Sludge Activity

David B. Smith, Asst. Director, Engineering & Industrial Expt. Station, Univ. of Florida, Gainesville, Fla., presented a paper titled "Respiratory Measurements of Activated Sludge."

Federation

Vice Pres.	Board Member
L. J. Fontenelli	*W. H. Larkin*
Superv. Engr.	*Chief, Polln. Control*
Rahway Valley Plant	*State Health Dept.*
Garwood, N.J.	*Albany, N.Y.*

Oxygen utilization by activated sludge is affected by many factors: sludge concentration, temperature, sludge condition, pH value, various chemicals, etc. Measurement of respiratory activity is made directly (using gaseous oxygen) or indirectly (by oxygen demand or carbon dioxide production determination); all methods being based on batch operations.

The author has previously described (Sewage and Industrial Wastes, Sept., 1952) an experimental activated sludge unit designed to operate on a continuous-flow principle. An indirect method of measurement has been developed which enabled this unit to be used for determining oxygen utilization by activated sludge under conditions similar to those applying in plant scale operation; i.e., either from the dissolved oxygen content of the inflowing sewage or from the oxygen introduced by aeration. In the study reported, the reaeration constant of a contact tank was based on the conditions of near-perfect mixing. The contact surfaces in the (Hays Process) unit were wire screens, thus detention was considered similar to that when no contact plates are used.

Based on his studies using synthetic sewages, the author concluded that—within a range of 0.2 to 6.0 ppm—the oxygen concentration of the activated sludge liquor does not significantly affect the rate of oxygen utilization. The unit rate of oxygen utilization decreases with increasing sludge concentration (19 per cent decrease in rate for an increase of sludge concentration from 200 to 500 ppm).

Increasing age of the activated sludge also decreased the rate of oxygen utilization (35 per cent decrease when sludge age increased from 0.5 to 1.5 days). The rate of oxygen utilization was found to increase significantly as the rate of B.O.D. loading increased. In the new method, oxygen uptake rates were found to measure 2.4 to 8.4 times greater than rates determined by conventional manometric measurements.

Discussion

A prepared discussion of the paper, by Dr. Harold A. Thomas, Jr., Assoc. Prof. of San. Eng., Harvard Univ., was presented in the absence of the author by Prof. Clair N. Sawyer, Mass. Inst. of Technology.

Reviewing the advantages of this new method, Dr. Thomas cited the value of using large volumes of samples—and thereby simulating more closely actual plant conditions. Practically any desired concentration of dissolved oxygen may be attained; the equipment is rugged and easy to clean; and laboratory routine is simple, requiring only that dissolved oxygen be measured in the influent and effluent. The principal limitation is that near-perfect mixing is required in the test unit.

Summer Resort Sewage

"Design and Operation of Sewage Treatment Plants for Resort Areas" was the title of a paper prepared by William A. Hardenbergh, Editor, Public Works, New York City, and Olney Borden, Consulting Engineer, Liberty, N.Y. Mr. Borden presented the paper.

It was made evident that treatment plants for this purpose represent a specialized field of design and operation; the facilities are required to meet sanitation needs but, in addition, they have proved of financial value to resort areas. Until recent years the State Health Department was concerned only with handling complaints; now, however, it is concerned with approval of treatment plant design and operation. With rapid growth of resort areas, there is vital need for sewage treatment and, under state laws, water and sewer districts may be formed by Town Boards. Approval of property owners representing more than 50 per cent of assessed valuation is required to establish such districts, and the Town Board remains in control.

Engineering problems involved include: high peak flows and high organic loading, especially when flows of receiving streams are lowest; frequently 50 per cent of stream volume is contributed by sewage effluent; construction, operation, and maintenance costs are relatively high; and efficient operation is required. The plants generally utilize two-stage high rate filters for summer operation, and the same units operating as standard trickling filters for winter operation.

Filter loading in summer is generally 2 lb. of B.O.D. per cu. yd. of coarse media (stone 3 to 4.5 ft. deep), and a low recirculation rate is employed. Heated digestion units usually are provided, with a capacity of 3 cu. ft. per capita; unheated digesters are designed with capacity of 4 to 5 cu. ft. per capita. While most treatment plants use covered sludge drying beds, the larger plants are equipped with vacuum filters (units are designed to operate on a one-day-per-week basis).

Chromium Waste Treatment Symposium

H. B. Channon
Mgr. Tech. Serv. Dept.
Va. Smelting Co.
W. Norfolk, Va.

W. N. Greer
Electro Chem. Sec.
Leeds & Northrop
Philadelphia, Pa.

C. F. Paulson
Spec. Applic. Dept.
Permutit Co.
New York, N.Y.

D. T. Armstrong
Process Engr.
Grumman Corp.
Bethpage, N.Y.

Construction costs for plants of this type (0.3 to 1.2 mgd capacity) averaged about $150,000 per mg in 1951. Careful design is required to keep costs low; primary and final settling tanks are usually made alike in order to re-use the same forms. Communities building such plants require engineering leadership rather than complicated reports.

Discussion

MILTON T. HILL, District San. Engr., State Dept. of Health, Middletown, N.Y., presented a discussion of the paper. He credited resort owners and public officials with greater consciousness of sewage treatment needs.

In one county (Sullivan) there were only two sewage treatment plants prior to 1935. There were seven new plants constructed by as many sewer districts in 1935-40. No plants were built during the war years but, since 1947, five new plants and four replacement plants have been built.

New York State has some 2,375 individual places in resort areas (housing not less than 10 persons each) with a total capacity of 170,000, excluding those using municipal sewer systems. The Health Dept. program to include these areas started in 1937, but adequate personnel was not available until 1940; excellent results have been accomplished. In 98 per cent of the installations the treatment includes chlorination.

Industrial Waste Symposium

Chromium Wastes—Treatment or Recovery?

KENNETH S. WATSON, Coordinator of Waste Treatment, General Electric Co., Schenectady, N.Y., introduced this symposium by presenting a paper titled: "Action Short of Treatment in Minimizing Chromium Waste Problems".

The volume of waste to be treated is of primary importance in any problem of treatment or disposal. Gauging may be accomplished through the use of weirs or measurement flumes of the Parshall type. Sampling should be proportioned to the rate of flow throughout the operating hours, to insure accurate interpretation of analytical results in terms of wastes requiring treatment. Compositing of individual samples will reduce the amount of analytical work required.

Reducing the volume of waste is good economy. Mr. Watson discussed the following conservation possibilities in a plating plant: Installation of automatic valves to control water usage; counter current rinse; fog sprays; properly designed rinse tanks; drag out reduction (using dip tanks or drip boards); prevention of leaks and accidental losses; settling or exchanging baths; and evaporation with re-use of concentrate.

Programmers

Symposium Chairman
K. S. Watson
Waste Treat. Coord.
General Elec. Co.
Schenectady, N.Y.

Discussor
Prof. C. N. Sawyer
San. Engr. Dept.
Mass. Inst. Tech.
Cambridge, Mass.

Mr. Watson pointed out that, as an average requirement, levels of hexavalent chromium concentration must not exceed 5.0 ppm when wastes are discharged to a municipal sewage treatment plant; the concentration in wastes discharged to a stream, however, must be controlled at 0.5 ppm or less.

Chromium Wastes—Chemical Reduction

Under the title "The Use of Sulfur Dioxide in the Reduction of Chromium Wastes", H. B. CHANNON, Mgr. Tech. Serv. Dept., Virginia Smelting Co., W. Norfolk, Va., described three frequently used reductants: Sulfur-dioxide, ferrous sulfate, and sodium bisulfite. He pointed out that a strongly acidic reducing agent is required and that reclamation of chromium from sludges should be considered. In batch processes, 16 to 24 hour capacity holding tanks, preferably in duplicate, should be specified. In continuous processes, a collecting tank to insure even flows to the treatment tank is desirable.

Instrumentation of Treatment

"Instrumentation of the Chromium Waste Treatment Process" was the title of a paper by W. N. GREER, In Charge of Electro Chemical Section, Leeds and Northrop Co., Philadelphia, Pa., in which he explained the theory involved in the application of instrumentation to the reduction of hexavalent chromium. Mr. Greer presented sixteen equations to explain the oxidation-reduction relationships between ferrous sulfate and hexavalent chromium.

Emphasis was placed on the observence of caution when generalizing on plant layouts where it is intended to use pH control and oxidation-reduction instrumentation. The suggestion was made, however, that modern electronic control equipment has definite application in waste treatment problems involving chlorination or biological systems.

Ion Exchange Applications

"Chronic Acid Recovery by Ion Exchange," by C. F. PAULSON, Special application Dept., Permutit Co., New York, N.Y. If means can be found to prevent waste by reclaiming used solutions economically, then costly chromic acid may be saved. Ion-exchange equipment can remove metallic cation impurities from chromic acid plating solutions and render them suitable for re-use. Final rinse tanks pick up quantities of chromic acid and other impurities which may be subjected to complete de-ionization. The used caustic regenerant (containing sodium chromate) of anion exchangers is passed through a cation exchanger where additional chromic acid is conserved for the plating bath.

Slides were used to provide cost data on chemical reduction methods versus ion-exchange methods of treating chromium plating wastes.

Plant Application of Ion Exchange

"Use of Ion-exchange in Recovery of Chromic Acid at Gruman Aircraft Corp." This paper was prepared by

D. T. ARMSTRONG, Process Engineer, Plant No. 2, Grumman Aircraft Engineering Corp., Bethpage, N.Y.

The reclamation of chromic acid using ion-exchange equipment, in addition to saving chromic acid, conserves water and heat. The plating operation, from which the waste at this plant is received, consists of aluminum anodizing.

To insure superior plating, both the plating and rinse baths must be kept clean. This is accomplished by passing bath waters through cation-anion exchangers as described by Mr. Paulson. Slides were used to illustrate the use of ion-exchange equipment as installed at the Grumman plant.

Rapid Chemical Methods of Waste Analysis

Oxygen Demand Test

"Chemical Oxygen Demand, The New Standard Method," by W. W. SANDERSON, Chemist, Division of Laboratories, State Department of Health, Albany, N.Y.

The chemical oxygen demand test not only has rapidity in its favor, but is independent of bacterial growth as it represents the immediate oxygen demand. The chemical test does not directly correlate with biological oxygen demand values on industrial wastes, plant effluents, on stream samples—but is particularly useful when B.O.D. values cannot be determined.

Disadvantages inherent in the permanganate test were pointed out, together with a comparison of confidence limits and standard deviations between all known tests. The Dichromate Reflux Method has been selected as the standard method because of reproducibility and manipulative advantages, and especially because of its wide applicability. A correction must be made in the Dichromate method when determining the C.O.D. of solutions high in chloride.

Oxygen Consumed Test

"Determination of Chemical Oxygen Consumed—A Rapid Dichromate Method," by NANDOR PORGES, LENORE JASEWICS and SAM R. HOOVER, Eastern Regional Laboratories, U.S. Dept. of Agriculture, Philadelphia, Pa. Paper delivered by Mr. Porges.

The test procedure outlined depends upon brief (6 min.) heating to a high temperature (165°C) for the oxidation reaction. Slides illustrated how the B.O.D. and C.O.D. values compared when various types of organic compounds were examined.

Harry E. Schlenz
Vice Pres.
PFT Co.
Chicago, Ill.

Arnold L. Wilcox
Sales Engr.
The Dorr Co.
Stamford, Conn.

Uhl T. Mann
Supt.
Ley Creek Plant
Syracuse, N.Y.

Anton E. Sparr
Supt.
Bay Park Plant
Nassau City, N.Y.

Sludge Digestion Symposium

Features of the test include reproducibility, speed and simplicity. The authors have also used the test in connection with industrial waste investigations.

Organic Matter Test

"A Rapid Method for the Determination of Organic Matter in Industrial Wastes," by SUMNER KAUFMAN, Sanitary Chemist, Lederle Laboratories Division, American Cyanamid Co., Pearl River, N.Y.

A rapid oxygen demand test, not subject to chloride interference, was described. The sample is also heated in this test. The one standardized solution (0.1 normal $KMnO_4$) acts also as the indicator, typical of permanganate titrations.

The test procedure has been used in analyzing the effluents from three

Programmers

Dichromate Methods
W. W. Sanderson
Chemist
Div. of Labs.
State Health Dept.
Albany, N.Y.

Permanganate Method
Sumner Kaufman
San. Chemist
Lederle Labs. Div.
Amer. Cyan. Co.
Pearl River, N.Y.

trickling filters, with good correlation on duplicate samples. Effluents from processing operation at Lederle are controlled on the basis of this simple test, thus regulating the organic waste load delivered for treatment.

Discussion

In a brief discussion period, DR. C. N. SAWYER, Mass. Inst. of Tech., requested information concerning the need for close control of the time element as was stated in the rapid dichromate C.O.D. test. Mr. Porges and Mr. Hoover agreed that in field determinations results would not be adversely affected by over-boiling, but that a minimum of 6 minutes is required.

Mr. Linn H. Enslow, Editor, *Water & Sewage Works*, asked about the use of the new dichromate test on other than carbohydrate wastes. Mr. Hoover replied that their investigations had not yet been extended to include other compounds.

Operators' Symposium

An Operators' Symposium on Sludge Digestion was conducted by VICE-PRESIDENT FABER. He suggested the session might be termed a clinic on digestion and indigestion, with two equipment company representatives serving as specialists and four plant operators presenting case histories.

Good Sludge Digestion

The "clinic" was opened by HARRY E. SCHLENZ, Vice-President, Pacific Flush Tank Co., Chicago, Ill., whose remarks were concerned with general features of the sludge digestion system, which he termed the "workhorse" of the modern sewage treatment plant.

Digestion is dependent on biological action, the final result being a stable residue plus gases, liquids and inorganic compounds. He emphasized that proper balance in the digester (and thus efficient operation) requires adding sludge as frequently as feasible and withdrawing sludge frequently and in small quantities. Temperature of the digester contents should be kept as uniform as possible, since methane producing organisms cannot tolerate rapid changes in temperature.

Good digester conditions will result in proper pH (6.8 to 7.2). Testing for volatile acids can foretell the approach of retarding digestion conditions. By good operation, excessive scum can be avoided, foaming can be prevented, and digestor liquor quality can be controlled.

Good Sludge Mixing

The second "specialist" was A. L. WILCOX, Sales Engineer, The Dorr Co., Stamford, Conn. His paper discussed mechanical stirring in digesters to control scum, aid in uniform heat distribution, and insure adequate mixing of raw and well-digested seed sludge.

Slides illustrated a fixed cover digester with a Draft Tube Mixer installed, and presented comparisons of sludge characteristics in mixed and non-mixed tanks.

Sludge Digestion Problems At Syracuse

The first speaker on the operators' panel was UHL T. MANN, Supt., Ley Creek Sewage Treatment Plant, Syracuse, N.Y. He pointed out that scum is a contributor to lost digestion capacity, increases operation and maintenance costs and damages structures. It should be kept out of digesters. Though recirculation and mixing devices assist in relieving the problem, they do not eliminate them.

At Syracuse, screenings, and skimming are now burned in an incinerator, with a definite reduction in the former scum problem. Mr. Mann noted the increase in use of paper towels has added cellulose to digester loading.

At Schenectady

The second operator's report presented was that prepared by C. E. IRVING, Supt., Bur. of Sew. Treat., Schenectady, N.Y.; in his absence the report was read by CARL BERNHARDT, Regional Engr., State Dept. of Health, Rochester, N.Y.

Overloaded conditions in the old Imhoff tank plant at Schenectady necessitated the construction of new sewage treatment facilities. Existing basins were converted to longitudinal settling tanks and a sludge digestion system was provided.

At Nassau County

A. E. SPARR, Supt., Bay Park Sewage Treatment Plant, Nassau County, N.Y., presented the third discussion entitled: "Early operating difficulties at the Bay Park Sewage Plant."

On opening day, the digesters at this plant were filled with cold sludge. Heat exchange equipment was not operable, so sludge digestion was not possible until heat could be supplied. After fifteen days' heating, response was satisfactory on one digester and warm sludge was then used as seed in stimulating digestion in additional units.

At an Institutional Plant

Final panelist for the operators was W. L. EDWARDS, Senior Sewage Plant Operator, Gowanda State Hospital, Gowanda, N.Y.

Replacement of one digester cover due to corrosion was reported, but no other operating difficulties were encountered. Mr. Edwards stated that at his plant the average pH of digester operation is 7.1, with average temperature of digester contents being 90°F.

An active discussion period followed the panelists' presentations, indicating the desirability of retaining this feature in future programs.

Rapid Cleaning of Meter Parts by Abrasive Machine

Airless blast cleaning has been used with a high degree of success for removing rust and corrosion from water meter parts during reconditioning. It quickly scours every trace of rust and corrosion from the metal parts and leaves a matte-type surface on the work which makes the meters look like new.

A piece of equipment commonly used for this work is a Wheelabrator Tumblast with a 2-cubic ft. barrel capacity. One eastern reconditioner using such a machine is able to clean typical loads of 20 of the ⅝" size meters in approximately 15 minutes per load, so that at least 40 per hour or 320 per 8-hour day are cleaned with ease. The machine will accommodate loads of larger sized meters also.

The unit has a continuous rubber apron-type conveyor belt which forms the blast chamber. The belt conveyor continually draws pieces up from the bottom of the barrel load and cascades them over the top of the load where they are subject to the cleaning action of metallic abrasive thrown centrifugally by a rotating bladed wheel in the roof of the cabinet. In this way, all areas of the work receive the same amount of cleaning action.

The abrasive, after striking the work, drops into a hopper and passes through a re-cycling system which removes the contaminants from it. The cleaned abrasive is fed to the hurling wheel for re-use.

Clyde E. Williams Engrs. Announce Expansion

Clyde E. Williams & Associates, Professional Engineers, Indianapolis, Ind., have announced the affiliation of August W. Compton, Arthur H. Plautz, and Thomas J. Driscoll as members of the firm to expand their services in civil and sanitary engineering.

Mr. Compton was formerly district airport engineer of the civil aeronautics administration; Mr. Plautz had been sanitary engineer with the Indiana State Board of Health; and Mr. Driscoll came from the Portland Cement Assn.

C. M. Gard

Gard Made an Associate in Stilson Firm

Alden E. Stilson & Associates, Ltd., Consulting Engineers, Columbus, Ohio, have announced that Charles M. Gard has become an associate in the firm.

In addition to Mr. Gard, the organization now includes: Alden E. Stilson, Paul M. Holmes, Roger W. Loveless, and M. H. Walters.

Huntington, W. Va., Loses in Appeal to Have Pollution Abatement Order Voided

A court case in West Virginia almost identical with that recently lost by Superior, Wisconsin, has been decided against the City of Huntington, W. Va., in favor of the State Water Commission of W. Va.

The City of Huntington in August 1949 was presented with an order from the State Water Commission to provide treatment of the City's sewage. Huntington petitioned the County Circuit Court to void the order on two grounds—(1) that the Commission in issuing the order was arbitrary and acted in excess of its statutory powers; (2) that the Act under which the State Water Commission is empowered "to require a municipal corporation with limited powers of action, and a financial expenditure which the said City is without sufficient authority or means to undertake," is unconstitutional.

The case was decided against the City of Huntington in the County Circuit Court. The decision was then appealed to the State Supreme Court which has just handed down the decision that the State Water Commission's powers are constitutional and its actions warranted. Huntington, like Superior, Wis., will now be forced to install a sewage treatment plant and find the money to pay for it.

WATER—the *softest* thing in the world but destroyer of the *hardest* things in the world.

463 N.P.A. Approved Water and Sewage Projects for Fourth Quarter 1952 to Cost $124,993,948.

Year's Total Approved Projects to Cost $1,596,115,333.

The Water Resources Division of the National Production Authority concluded the year 1952 with the release of the detailed list, shown below, announcing that 463 new projects had been approved and had received allocation of all necessary materials under the Controlled Materials Plan for the Fourth Quarter, 1952. Water Projects total $42,465,102.00. Sewage Projects, $82,528,846.00, making a total of $124,993,948.00.

WATER & SEWAGE WORKS will publish the combined Quarterly Totals for 1952 in the April, 1953, issue.

SUMMARY BY STATES AND TERRITORIES

ALLOTMENTS GRANTED BY WATER RESOURCES DIVISION OF THE NATIONAL PRODUCTION AUTHORITY

Fourth Quarter from October 1, 1952, through December 31, 1952

States	No. of Projects	Value of Projects	
		Water	Sewage
Alabama	6	$ 247,800	$ 250,000
Arizona	9	1,925,035	.....
Arkansas	3	949,535	.....
California	65	3,452,638	8,217,144
Colorado	7	2,129,537	650,000
Connecticut	2	.....	.....
Delaware	....	.....	.....
Dist. of Col.	10	1,080,000	1,375,240
Florida	11	4,467,758	678,000
Georgia	5	1,807,007	.....
Idaho	4	90,750	275,000
Illinois	20	1,775,754	1,361,173
Indiana	7	698,000	6,105,000
Iowa	3	7,775	.....
Kansas	8	322,635	109,105
Kentucky	9	349,267	1,002,300
Louisiana	11	1,647,333	1,588,450
Maine	1	3,600	.....
Maryland	14	148,790	486,000
Massachusetts	5	23,000	273,600
Michigan	18	610,141	375,600
Minnesota	2	225,000	75,000
Mississippi	5	104,900	.....
Missouri	7	291,310	127,000
Montana	2	125,000	261,640
Nebraska	6	294,293	150,000
Nevada	1	.....	100,000
New Hampshire	....	.....	.....
New Jersey	7	177,000	16,834,440
New Mexico	1	128,071	.....
New York	25	1,759,569	2,645,830
North Carolina	9	584,941	444,397
North Dakota	....	.....	.....
Ohio	19	757,030	6,500,000
Oklahoma	7	.....	3,972,492
Oregon	9	240,000	938,000
Pennsylvania	28	2,061,026	10,906,762
Rhode Island	....	.....	.....
South Carolina	5	700,052	617,019
South Dakota	1	.....	70,000
Tennessee	15	1,409,687	575,000
Texas	45	6,537,576	8,514,080
Utah	2	10,100	20,000
Vermont	....	.....	.....
Virginia	13	1,350,083	3,318,360
Washington	13	1,540,809	57,500
West Virginia	2	261,300	.....
Wisconsin	7	93,600	1,753,600
Wyoming	....	.....	.....
Alaska	....	.....	.....
Guam	....	.....	.....
Hawaii	8	725,700	1,816,814
Puerto Rico	6	1,351,700	83,500
Totals	463	$42,465,102	$82,528,846

Total for fourth quarter 1952 $124,993,948

*Allotments for 1st, 2nd and 3rd quarters published in W. & S. W. for Aug. 1952; Nov. 1952 and Feby. 1953.

Fig. 1—SPRINGFIELD'S 30 mgd Main Sewage Treatment Plant

Preventive Maintenance

Checklist for Pumping Units Electrical Units Mechanical Units and Personnel

by JOHN D. McDONALD, *Supt., Sewage Treatment Plants, Springfield, Mass.*

FROM time to time, at meetings, we are told that our pumping stations and plants for the treatment of water, sewage, and industrial wastes have become so mechanically complicated that the average "non-genius" operator is having his hands full keeping things running on an even keel. There are two sides to this problem, and perhaps the designing engineers have been more farsighted than we operators in foreseeing serious manpower shortages. I for one am thankful for a majority of the man-saving equipment and so-called automatic gadgets in our various installations. Of course, such devices must have attention to keep running; but, if given just the minimum of consideration and care, they become pretty faithful servants—and when properly lubricated seldom give much backtalk.

The City of Springfield, Mass. has two primary sewage treatment plants, one of 30 mgd capacity and one of 3 mgd. See Figs. 1 and 2. All sewage is pumped to the 30 mgd plant. It passes under the Connecticut River to the plant site from an attended pumping station in the city, and is pumped by three 15 mgd capacity vertical centrifugal pumps driven by diesel engines thru right angle drives. In addition to this main pumping station, there are seven low lift sewage pumping stations, electrically operated and unattended, varying in capacities from 1.5 mgd to 8.0 mgd. See Figs. 3, 4, 5 and 6. Due to the topography of the city, some of the sewage is pumped three times.

In this system there is about one example of everything in the line of mechanization. There are over 400 electric motors ranging from fractional HP units, operating laboratory equipment, to 200 HP storm water pumps; eight 250 HP and two 425 HP gasoline engines; three 125 HP diesel engines; and 250 assorted pumps ranging from chemical solution pumps to 52,000 gpm sewage pumps. At the treatment plants there is the usual assortment of units including mechanically cleaned racks, detritors, narrow gage railroad for grit disposal, comminutors, clarifiers, sludge pumps, and equipment required for digesters, gas collection and utilization, vacuum filtration and incineration.

The same organization maintains six gasoline powered flood control pumping stations having a combined capacity of 360 mgd. While these stations operate only about 2.5 per cent of the time, they must be kept in instant readiness and, therefore, are test run for two hours each week.

In the twelve years that this system has been in operation, many valuable lessons in maintenance have been learned and it is hoped that others may profit from our experiences. It is far better, and cheaper too, that equipment be kept running thru a program of preventive maintenance —rather than to have a long, costly and embarrassing shut-down. This is becoming increasingly true each day, what with material shortages, difficult procurement procedures, arbitrary budget cuts, a marked lack of initiative on the part of employees, and the difficulty of luring competent new personnel to the generally low wage civil service positions. All these obstacles make good maintenance a must for those of us responsible for keeping the wheels revolving.

Mr. McDonald has been a repeat speaker on the subject of Preventive Maintenance at the annual Short School for Sewage Plant Operators at the University of Massachusetts. He has enlarged on the material presented there in preparing this extremely practical article for the readers of *Water & Sewage Works.*

The Program Required

A good preventive maintenance program pays off in several ways, because it will:

Prolong the usable life of the installation
Insure continuity of operation
Reduce unit costs
Establish good public relations
Maintain higher morale among personnel

Basically the program consists only of common sense and good housekeeping.

In general we have found that practically all breakdowns in sewage treatment work fall into one of the following categories:

1. Pumping failures
2. Electrical failures
3. Mechanical failures
4. Personnel failures

Checklist for Pumping Units

The following program of preventive maintenance provides a useful checklist to reduce failures of pumping units.

Daily Inspection

Note any irregularities of operation
Investigate any change in sound or unusual sound
Check bearing temperatures
Check for proper stuffing box leakage
Check pressure and flow gauges

Semi-annual Inspection

Inspect packing
Check alignment of pump and driver
Drain and refill oil lubricated bearings
Check grease lubricated bearings

Annual Inspection

Remove bearings, clean and examine, and clean bearing housing
Remove packing and examine shaft and shaft sleeves
Disconnect coupling and check alignment
Check end play and correct if factory specifications are exceeded
Clean, drain and flush sealing water piping

Fig. 2—SPRINGFIELD'S 3 mgd Sewage Treatment Plant
(The Indian Orchard Plant)

Note on Packings

When removing and replacing packing rings, be sure to remove and replace all rings and stagger the rings. If there is a lantern ring, be sure it is in line with the sealing water connection and do not change this position when packing in succeeding rings.

Positive Displacement or Plunger Type Pumps

Use good quality square packing
Do not screw glands too tight and keep tension even (This is true in centrifugal pumps)
Should be small amount of leakage. (Also true in centrifugal pumps)
Ball valve chambers should be opened occasionally
In closing see that washer is seated properly
Keep extra valve chamber gaskets on hand
Replace balls before they wear small enough to clog

CENTRIFUGAL TYPE PUMPS

Centrifugal pumps are more commonly used in sewage work. The following check list can be referred to when troubles occur and may help to localize the difficulty and speed up corrective action.

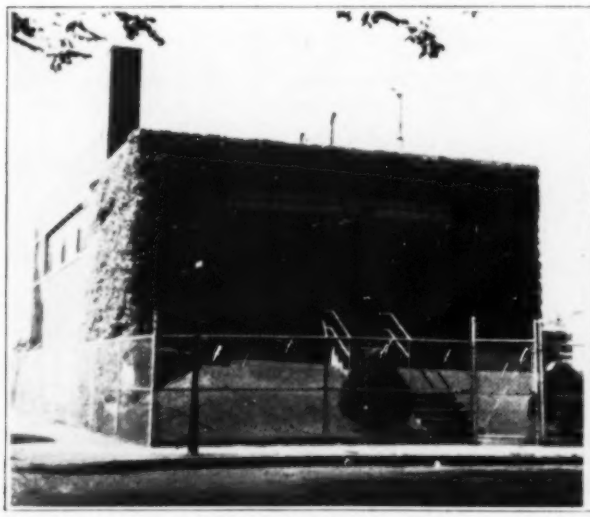


Fig. 3—YORK STREET Pumping Station
The main pumping station delivering sewage under Connecticut River to treatment plant. Station also serves for flood control.

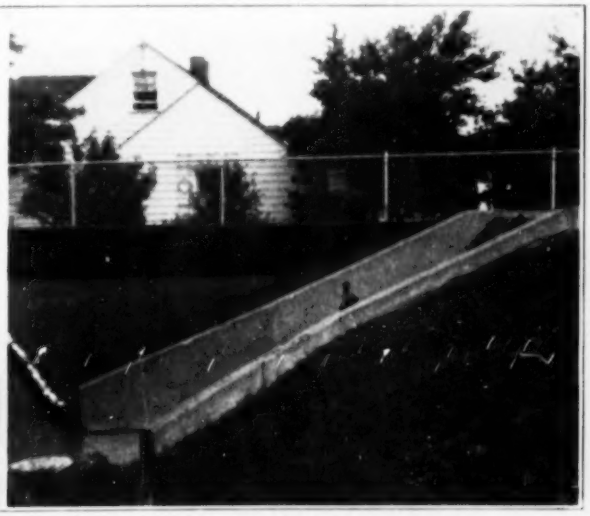


Fig. 4—CAREW STREET Pumping Station
Located in residential area, this station has no superstructure. It is well landscaped and grounds have appearance of small park.

Fig. 5—ENGINE ROOM at York Street Station
Diesel engines and right angle drives operate pumps on floor below

Pump Does Not Deliver

Possible Cause:

Pump not primed
Suction lift too high
Excessive air or gas in liquid
Wrong rotation (Don't laugh)
Suction inlet not submerged
Speed too low
Total system head greater than design head of pump
Clogged impellor

Insufficient Delivery

Possible Cause:

Suction lift too high
Air or gas in liquid
Air leaks in suction line or pump
Foot valve too small or clogged
Inlet valve not completely submerged
Speed too low
Total system head greater than design
Impellor clogged or damaged
Wearing rings worn excessively

Priming Lost After Starting

Possible Cause:

Suction lift too high
Excessive air or gas in liquid
Air leaks in suction line or pump
Suction inlet not submerged

Excessive Power Required

Possible Cause:

Speed too high
System head not in design range
Liquid viscosity differs from design
Foreign matter in impellor or pump
Mis-alignment
Bent shaft
Rotating part rubbing stationary part
Wearing rings worn
Improper packing installation
Gland too tight

Stuffing Box Leaks Excessively

Possible Cause:

Mis-alignment
Bent shaft
Worn shaft or shaft sleeves
Improperly packed
Rotor out of balance

Packing Has Short Life

Possible Cause:

Water seal line plugged
Seal cage (lantern ring) improperly located
Mis-alignment
Bent shaft
Worn bearings
Worn shaft or shaft sleeves
Improperly packed
Gland too tight
Grit in sealing liquid

Pump Vibrates

Possible Cause:

Suction lift too high
Suction inlet not submerged
Operation at too low a capacity
Foreign matter in impellor
Mis-alignment
Foundation not rigid
Bent shaft
Rotating part rubbing stationary part
Worn bearings
Impellor damaged
Excessive thrust due to internal mechanical failure
Lack of lubrication or improper lubrication

Bearings Have Short Life

Possible Cause:

Mis-alignment
Bent shaft
Rotating part rubbing stationary part
Bearings worn
Rotor out of balance (Vibration)
Improper lubrication

Pump Overheats and Seizes

Possible Cause:

Pump not primed
Operation at too low a capacity
Parallel pump operation not suitable
Mis-alignment
Rotating part hitting stationary part
Worn bearings
Improper packing
Gland too tight
Improper lubrication

Checklist for Electrical Units

We have found that electrical failures generally fall into one of the following categories:

1. Moisture or other foreign matter in motor or wiring
2. Overload
3. Improper lubrication of motor
4. Defects in controls or starting devices

Electrical maintenance can be summed up in one short sentence—KEEP THE APPARATUS CLEAN AND DRY. This is what is meant by good housekeeping and common sense. As simple as it is, look around your own plant and if you are like the rest of us you will find some motor which is getting a raw deal.

Useful Suggestions

Suitable precautions must be taken to protect the equipment from moisture, oil, dust, grease and corrosive gasses.

Watch overhead dripping and excessive splashing when washing floors.

In damp and humid locations install a humidity control switch to operate a circulating fan to correct the condition.

Low voltage heating can be used in locations where normal usage does not keep windings dry.

Tools, oil cans, bolts, etc., must not lie around the motor or frame.

Keep motors free of dust by the occasional use of compressed air or a hand bellows. When using compressed air, the pressure must be reduced to a low pressure which will not damage the insulation and it must be dry.

There must be periodic checks of insulation on equipment in hazardous locations.

Always make a complete check on any idle equipment prior to putting it back into operation.

Use only qualified personnel to maintain electrical equipment.

Have hard and fast rules relative to power being *off* while work is being done on electrical equipment.

Try to follow the manufacturers instructional manual.

Your Own Trouble-Shooter

Now all this may sound very complicated and would seem to require the services of an electrical engineer to make these checks but this is not so. Any one of your good operators can become your electrical trouble shooter and call your attention to a spot where corrective action may prevent future trouble.

The Volt-Ammeter

The equipment needed is not too expensive. For a start there should be a clamp-on volt-ammeter. The photo, Fig. 7, shows the simplicity of its use. Instantly the load on any motor can be measured. Which brings up another point, after reading the nameplate data on the motor, when the plant is first put into operation a check on each starting device should be made to see that it is properly fused or protected with the right overload safety heater. In addition to ascertaining the possible overload, this information is valuable in running down causes of low power factor due to underloading of motors.

The "Megger"

Another valuable piece of equipment is the "megger," shown in Fig. 8. Its use is very simple. With this small portable device, the insulation resistance of any equipment or circuit can be measured instantly and a potential breakdown discovered. The instrument is invaluable in locating open circuits and other electrical failures.

At this installation all motors are card indexed and periodically meggered, the time interval being determined by the location and use of the motor. Motors in damp environments and not constantly in use must be checked more frequently. These readings, entered on a card and plotted on the logarithmic graph, give an instant visual story of the condition of the windings; and if the resistance is low will warn you not to energize this motor prior to drying out the insulation. One of our record cards is illustrated in Fig. 10.

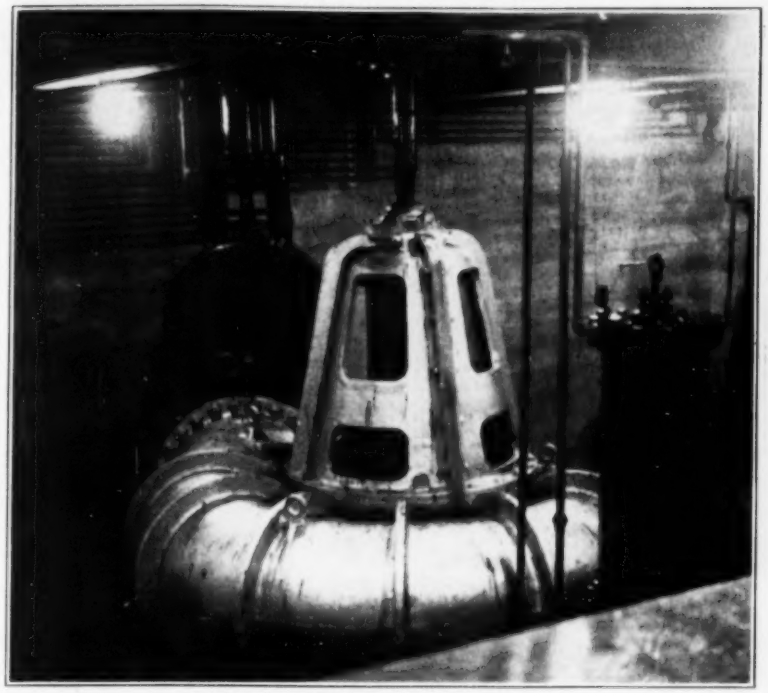


Fig. 6—PUMP ROOM at York Street Station
One 15 mgd pump is shown. Vertical drive shaft is from floor above

Other Equipment

The industrial analyzer is another valuable asset to your plant, although not really a necessity except in the larger installations. For our set-up, I consider it necessary. This device is illustrated in Fig. 9.

The final tool at your electrical serviceman's disposal is the simple pocket voltage tester.

Checklist for Mechanical Units

Our experience shows mechanical failures generally to stem from one of the following factors:

1. Normal wear and tear
2. Points of excessive abrasion
3. Improper lubrication
4. Corrosion

We must be resigned to the fact that normal wear will take place as the price of operation. We only can check regularly and correct conditions before excessive wear causes a failure at an embarrassing time. To prevent this, we should schedule periodic replacement of wearing parts and do the work as near as possible under ideal conditions.

In places where excessive wear from abrasion or other peculiarities of operation can be anticipated, hard facing can be welded on surfaces at these points by the use of a relatively inexpensive welding machine. One of the more interested operators at your plant can be trained in this work. It makes the ideal type of work to do during the night shifts or on weekends when both equipment use and supervision are at a minimum. Examples of this work are illustrated in Fig. 12.

Advice on Lubrication

To minimize failures from improper lubrication, the best recommendation is to conform as closely as possible to the procedure given in manufacturers' instruction manuals. After all, the maker of the equipment should know more than anyone else about how to keep in running. Go along with the maker's instructions until they are proved wrong.

A Routine Program

Next, organize a definite lubrication program. All the major petroleum companies have expert lubrication engineers who will gladly survey your installation at no charge and submit an excellent program in which the total number of lubricants will be minimized for simplicity. This, done in conjunction with the manufacturer's recommendation, is advisable to reduce the required number of lubricants around your plant. In this way you can continue to deal with your favored petroleum outfit. After the program has been organized, fix the responsibility for carrying it out. We have found that it is better for one man to do all this type of work. Then he has no reason to assume that "George" will do it, and neither will

Fig. 7—CLAMP-ON Volt-Ammeter
In operation to record current being used by this motor

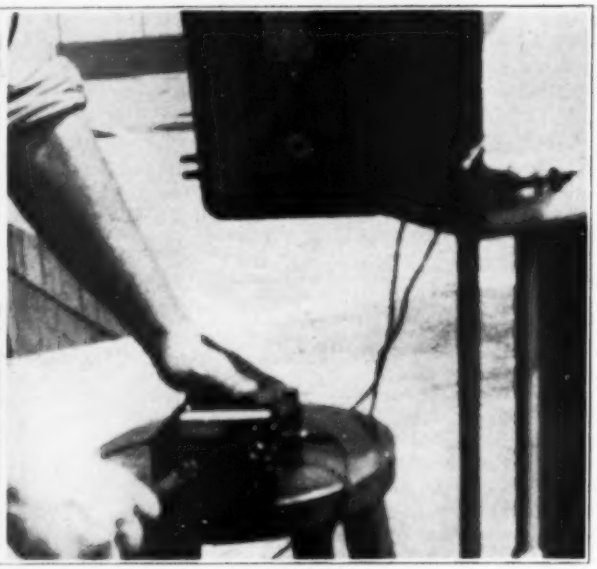


Fig. 8—MEGGER in use
Testing insulation value of wiring on exposed drive motor

five men grease the same motor just because it happens to be used on all shifts.

Bearing Failures

Under lubrication, bearing failures are especially important and should be discussed briefly. The most common causes of bearing failures are:

1. Carelessness—This means allowlowing dirt or foreign matter to collect in the housing
2. Overloading
3. Improper lubricant
4. Over lubrication
5. Lack of lubrication

In regard to the last two types of failures, I would pick overlubrication as the greater evil, particularly in reference to motors and bearings. At least if it is lack of lubrication, the sound will soon call your attention to the lack but for over lubrication, your first knowledge may be a burned out motor due to the breakdown of the insulation on the windings because they may be impregnated with surplus oil or grease. In short, bearing lubrication may be summed up in a nutshell — SUFFICIENT GREASE FOR LUBRICATION WITH A PLACE FOR THE EXCESS TO GO.

Corrosion Failures

Corrosion failures generally are due to attack caused by moisture or by chemicals. Exposed metal surfaces must constantly be protected against corrosion. Each person has a right to his own favorite protective coatings—but be sure you do have one and that you use it freely. It should be applied frequently to all exposed metal surfaces: replacement steel for rails and gratings is scarce, and costs money. See Fig. 11.

To protect against chemical corrosion, suitably resistant materials must be selected for each condition. For example, all equipment in contact with ferric chloride should be rubber covered or rubber lined. Corrosive atmospheres should be well ventilated.

The application of protective paints and coatings is another type of job particularly suited to night shift operators, as the amount of work done is clearly evident.

Proper V-Belt Installation

Among preventive measures against mechanical failures, there should be some mention of V-Belts. Listed below are some of the conditions to be avoided in order to maintain proper installations. Check each of these:

Overtension
Undertension

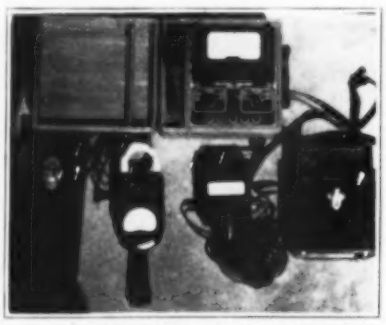


Fig. 9—ELECTRICAL Testing Instruments
Top, industrial analyzer; Lower left, clamp-on volt ammeter; Lower right, megger; and carrying cases

Unequal lengths in multiple installations
Belts left idle too long
Overage belts
Foreign matter on belts
Corrosive atmosphere
Sheaves mis-aligned or worn
Overload at start
Vibration

Checklist for Personnel

A proper training program is of first importance to reduce the frequency of personnel failures—and such a program can be very simple. It means, first, that new employees must be made to feel they are a part of the organization; second, that they really are necessary in the overall municipal function; and, finally, how their job is to be done.

Clear Instructions

To aid employees in doing their jobs properly, the following items are most important:

1. Instructions must be definite. You or your supervisor must know what you want done and also a way to do it. This information must be clearly transmitted to the employee. Being vague generally means that you don't know exactly what you want done yourself and subconsciously the employee gets to feel the same way.
2. The responsibility for carrying out orders must be fixed. The employee must understand that he and he alone is the one to do a particular job.
3. There must be instilled in the em-

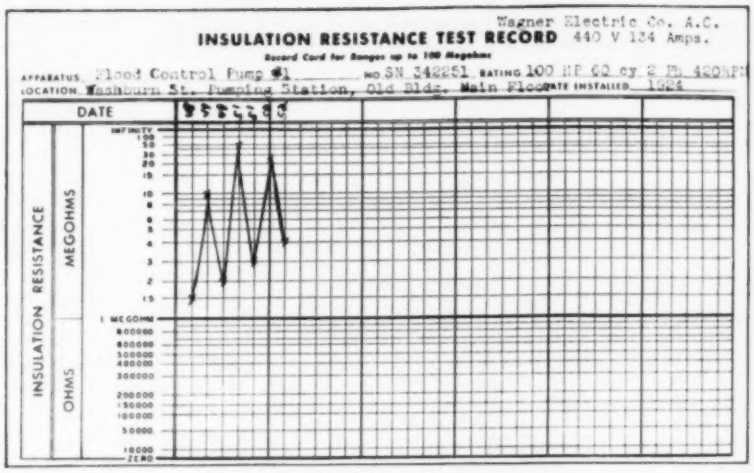

Wagner Electric Co. A.C.
INSULATION RESISTANCE TEST RECORD 440 V 134 Amps.
Record Card for Ranges up to 100 Megohms
APPARATUS Flood Control Pump #1 NO SN 342251 RATING 100 HP 60 cy 3 Ph 450RPM
LOCATION Washburn St. Pumping Station, Old Bldg. Main Floor DATE INSTALLED 1924
DATE
INSULATION RESISTANCE
MEGOHMS
OHMS

Fig. 10—FILE CARD for Megger Readings
Similar file card record is kept for all motors and electrical circuits

ployee a confidence in his superiors. This is axiomatic and ties in with the above.

Personal Responsibility

With personnel, it has been our experience that the average employee is happier when assuming some responsibility. He, too, derives a certain satisfaction in repairing or prolonging the life of equipment and should be encouraged to do so. Make the manufacturers instruction manuals and booklets available to the employee—*do not* keep them under lock and key in your office.

If possible, subscribe to a number of engineering magazines and set up a library available to the men, perhaps where they have their lunch. Our men have come to us with several fine maintenance ideas which were picked up in this manner.

Do not assume an attitude that to understand the equipment is above their mental plane but, to the contrary, encourage their thinking and ask for and be receptive to ideas and suggestions. They may not always be acceptable, but you must listen and explain away the poor one by logic and not by ridicule.

Tools are Essential

Now to get these minor adjustments and repairs done daily and by all employees, there must be a minimum assortment of tools and equipment available. The more valuable and less frequently used tools may be kept in security, but the commonly used tools must be made available so that their lack cannot be used as an excuse for failure to perform some maintenance function.

Maybe a few small tools will be missing occasionally but the average plant of this type cannot stand the expense of a tool room and tool issue man. All the missing tools in a year wouldn't pay one week's cost of such a set-up. And if too much stuff is missing, you have a personnel problem not a tool problem.

We have found it to our advantage to equip each of our shift operators with a small tool box with a minimum assortment for which he is more or less responsible; in fact, it has worked out so well that many of these men have supplemented these tools by purchases of their own for special items.

The basic tools and equipment for a plant of our size includes:

Wood tools

Hand saws, plane, squares, brace and collection of bits, chisels, screw drivers, level, axes, claw hammer, sledge, rules, steel tape.

Iron tools

Vise with solid bench, portable electric drill with large assortment and extra drill bits, motor driven two wheel grinder, hammer, good selection of wrenches, sockets, open end and adjustable, combination pliers, electrician pliers, tin snips, and a one ton hoist.

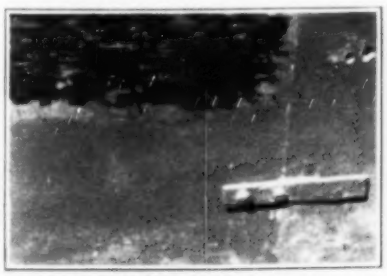


Fig. 11—CORROSION Prevention
This exposed steel plate is being scraped and will receive a coat of rust inhibiting paint

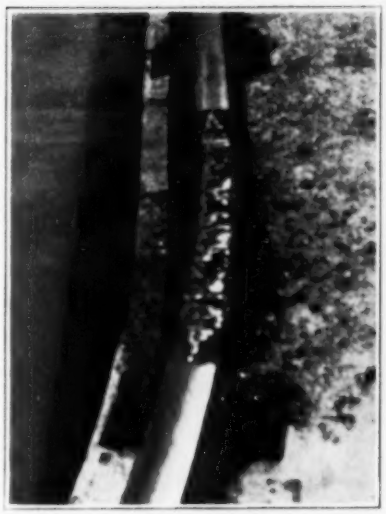


Fig. 12——EXCESSIVE Abrasion
Detritor track being hard faced at point of curvature. Work looks crude but adds many years to life of rail

Pipe tools

Set of stocks and dies, pipe cutter, reamer, pipe wrenches, pipe vise, packing and caulking tools, and an assortment of common size nipples, ells, unions and tees.

Miscellaneous tools

Emery wheel, oil stone, assortment of nails and screw, wrecking bar, crow bar, soldering outfit, blow torch, electric soldering iron, lawn tools, hoses, picks, shovels, wheelbarrows and a proper place to keep and store these tools.

It would help all operators if the designing engineers made these tools and equipment a part of the original contract to be supplied with the plant. That is the logical time to get the funds through for this type of purchase. The city fathers are always reluctant to make appropriations for equipment for their new plant.

The Preventive Maintenance Program

To return to the opening statement relative to mechanization. It must be admitted that mechanization can be a nightmare if there is a succession of serious failures. But the specter of manpower shortages can also be a nightmare. I think the modern designers and alert equipment manufacturers are on the right track in trying to mechanize as far as possible but only with tried and proven devices. It then becomes our problem to keep these machines in motion. In this article, an attempt has been made to point out ways to forestall unscheduled interruptions in operation.

Sewage Treatment of Scandinavia

As Practiced in the Four Capital Cities

by E. L. KNOEDLER, *Senior Engr., Sheppard T. Powell, Engrs., Baltimore, Md.*

IN four preceding articles the writer outlined the municipal water treatment practices followed in the capitals of the four Scandinavian Countries. In the U.S. efforts to clean up our streams and conserve our available water resources has caused nationwide interest in the treatment of sewage and industrial wastes. Naturally, these subjects came up for discussion during the trip to Scandinavia. Due to the fact that most communities are less congested and industrial development less concentrated than in this country, problems of stream pollution are much less severe. However, because of publicity here and in other congested areas, the Scandinavian people are interested and alert to the dangers of letting conditions get too far ahead of them.

This is the concluding article in the series by Mr. Knoedler.

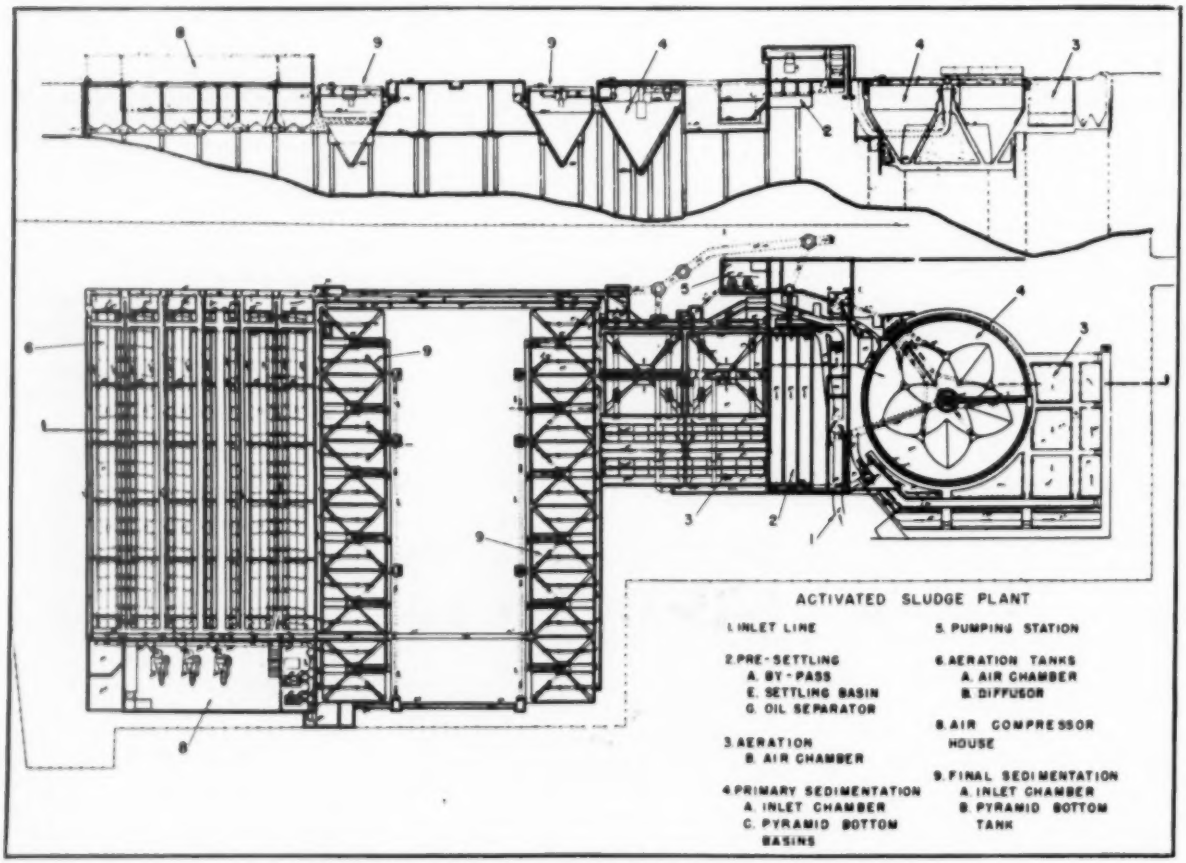
Previous articles, under the title *Water Supply of Scandinavia* dealt with the water supply of Oslo, Norway, in the March issue; with that of Copenhagen, Denmark, in the May issue; with that of Stockholm, Sweden, in the June issue; and with that of Helsinki, Finland, in the August issue.

Norway

The problem of sewage disposal in Oslo, like that of water supply, is one of increasing capacity to meet the needs of an expanding population. Regulations exist to prevent the creation of nuisances and ships are not permitted to pump bilge water into the harbor. This is important in view of Norway's large fleet. There are no specific regulations regarding shipyards and industrial waste waters are too scattered to present any real problem. The major problem is the disposal of domestic sewage.

The present activated sludge plant is operating at two and a half times its designed capacity. This increase was accomplished by adding preaeration and sedimentation treatment. Some operating difficulties have been caused by the increasing use of synthetic detergents, but it has been found that the detrimental effect of such compounds can be corrected by preaeration. The sewage is somewhat stronger than the average in this country, the raw sewage having a B.O.D. of about 200 ppm. Capacity is required to handle a flow of approximately 120 gal. per person per day, and the final effluent is intended to have B.O.D. of about 20 ppm.

Two sewage plants are now in operation, but it is recognized that a third one must be installed to meet



FLOW DIAGRAM of Oslo, Norway, activated sludge sewage treatment plant

increased loads imposed on the system. One of the existing plants is an activated sludge unit, one a plain sedimentation unit, and the new plant may provide presedimentation treatment followed by activated sludge. The present activated sludge treatment plant is illustrated in a flow diagram, Fig. 1.

Unusual Odor Control Method

A unique procedure for controlling odors has been incorporated into the design of the activated sludge plant. This is based upon the principle of floating an aerated fresh water on the surface of the treated sewage. The manner in which the water is added is similar to the practice in this country of spraying water on sewage or the surface of tanks to keep down foam. However, it is claimed that the water used does not mix with the sewage, possibly due to difference in gravity, and floats on the surface. There is a continuous withdrawal of fresh water off the surface so that the water essentially behaves as a floating cover of fresh water which effectively inhibits odorous gases being discharged into the atmosphere.

Various innovations such as sludge recirculation have been tried to increase the plant capacity and although the experiments are continuing the results have not been too successful so far.

Sludge disposal facilities originally were laid out so the sludge could be stored during the winter months and then barged to the ocean after the ice melted in the bay. However, it has been found that the sludge is so difficult to remove after setting for so long a period that it is cheaper to pay for the cost of an ice breaker and remove the sludge regularly. Plans now are being formulated to dispense with sludge storage entirely and to use the space for increasing plant capacity.

Sweden

Disposal of waste water and sewage in Stockholm is not a problem of the same magnitude as in the U.S. The health department has regulations which require that if water in the receiving stream or lake is not sufficient in volume to satisfactorily dilute the effluent, then the effluent must receive treatment. Most cities in the country have been required to build sewage plants. Twenty years ago the sewage was discharged to rivers or to the sea, but now the State provides the cities with money to build plants of adequate size. This is not true of Stockholm, a city which is better situated financially to construct its own plants. At present Stockholm has several activated sludge plants in operation, and the treated effluents are discharged into the sea, thus preserving the quality of Lake Malaren water for municipal use.

Although the industrial waste disposal problem is apparent to some extent in specific locations, it is not yet of sufficient magnitude to require compulsory separate treatment of such wastes.

Table I

Analyses of Raw and Treated Sewage from Plant at Copenhagen, Denmark

	Inlet to plant	Outlet from Settling Tank	Outlet from Improved Plant
Total Solids	1410	1220	920
Suspended	380	190	20
Dissolved	1030	1030	900
Total Residue on			
Evaporation	840	730	520
Volatile Residue	325	170	12
Fixed Solids	515	560	508
Settleable Solids after 2 hours settling	3.0	0.3	0.2
pH	7.6	7.4	7.7
Oxygen Consumed from Permanganate			
Unfiltered	226	148	31
After 2 hours settling	188	146	31
Filtered	123	106	31
Biochemical Oxygen Demand (5 days)			
Unfiltered	505	355	10
After 2 hours settling	425	335	8
Filtered	190	168	8
Total Nitrogenous Material			
Unfiltered	44	47	33
After 2 hours settling	40	45	32
Filtered	34	40	31
Ammonia—Nitrogen	27	32	19
Nitrite—Nitrogen	0	0	0.2
Nitrate—Nitrogen	0	0	9.0
Relative stability (decolorizing of methylene blue)			
Unfiltered	——	——	more than 20 days
After 2 hours settling	——	——	more than 20 days
Filtered	——	——	more than 20 days
Chloride	176	187	169
Readings made during sampling			
Results expressed in parts per million			
Average temperature °C	13.9	13.1	10.2
Oxygen concentration	——	——	7.4
Oxygen saturation—%	——	——	67
Temperature °C.	——	——	10.1
Barometer (Hg) in.	——	——	749

Finland

As in the countries of Norway and Sweden, industrial waste is not a problem in Finland. The domestic sewage of Helsinki is handled in two large sewage treatment plants. There is no specific law relating to such discharge, but the Department of Health has the power to enforce treatment if it seems desirable.

Denmark

Copenhagen suffers with a sewage problem much more serious than that of the other three capital cities. Only 20 percent of the sewage is delivered to sewage treating plants. Much of the sewage finds its way into some of the surface lakes which has ruined them as sources of water supply. Typical analyses of the raw and treated sewage are given in Table I.

One of the great pollution problems at the present time results from pumping raw sewage into the Baltic Sea; because of the lack of tides contamination of the surrounding water occurs. The Danes are aware that this situation has become increasingly serious in the last ten years. Plans are being formulated to install equipment for treating all the sewage flow. This country's plants, as in the case of Norway, were delayed in construction because of enemy occupation during the war years. Recovery has been rapid but improvements in the country's economy were of primary concern and it is only now that real effort is being concentrated on the less critical and more easily postponed problem of sewage treatment.

Western Waters Described in New Booklet

"Quality and Treatment of Water in the West" is the title of a new booklet which includes a tabulation of water quality and characteristics for approximately 1,000 cities and towns in the eleven Western States.

Reprints of six brief articles published in "Western Industry" under the general title *Water Characteristics May Profoundly Influence Plant Site Choice* comprise the first twelve pages of the booklet. Water analyses data, an additional ten pages, are devoted largely to qualities of significance in industrial water requirements.

Copies of the booklet, at 50 cents each, may be ordered from Western Industry, 609 Mission Street, San Francisco 5, Calif.

PLACING runners and POURING juted joints with hot "Vitro-Bond" sulphur compound.
Interior joints later pointed-up with "Alkor 5E" compound.

Esso Refinery Reconstructs Industrial Waste Sewer

Special Acid-Alkali Proof Compound Used for Jointing Large Diameter Clay Pipes.

by ALBERT KESHEN
Newark, N.J.

THE large and important Bayway Refinery of Esso Standard Oil Company at Linden, N. J., is replacing a portion of its sewer system ranging from pipe 36 inches in diameter to a brick arch section sewer of 20 square feet area. A water stream that is used to cool the products from the various process units, that may at times be acid or alkali, flows through the sewer network and discharges into a separator where entrained oil is reclaimed and salvaged. It is all an integral part of petroleum refinery operation.

The initial part of the sewer replacement program calls for replacing of an old 36-inch circular brick sewer and a 24-inch vitrified clay pipe line with 36-inch and 24-inch clay pipe.

The new sewer line consists of 1,200 feet of clay pipe, all in extra strength and broken down into 815 feet of 36-inch, 286 feet of 24-inch and the balance in 12- and 15-inch pipe.

Special Jointing Material

Clay pipe was preferred because of its acid-resistant and non-corrodable qualities. As a further precaution, special jointing material, namely "Alkor 5E," a product of Atlas Mineral Lead Products Co. of Mertztown, Pa., was employed for jointing the pipe. The compound consists of a resinous cement. Believed to be the first time that this material was used on 36-inch pipe, it insures further resistance of the sewer to acid, alkali and hydrocarbons.

In this construction the tile joint is first caulked with jute. The joint is then poured with vitro-bond sulphur compound, which is hot and sets fast. "Alkor 5E" is then packed by hand into the ¾-inch joint spaces on the interior of the line. By using this vitro-bond faced with the "Alkor 5E" the effluent passing through the sewer makes contact with the clay pipe and resinous cement only.

Some Construction Difficulties

Construction difficulties slowed up the job which began June 16, and was completed in September, 1952. The major problem was that of excessive water, since the ground is only 15 feet above sea level. It was necessary to dig drain sumps and in several places a stone bed was laid down in

TRENCHING with Bay City 45 ft. Excavator with 42 in. bucket and BACK-FILLING with Caterpillar I D-2 Bulldozer

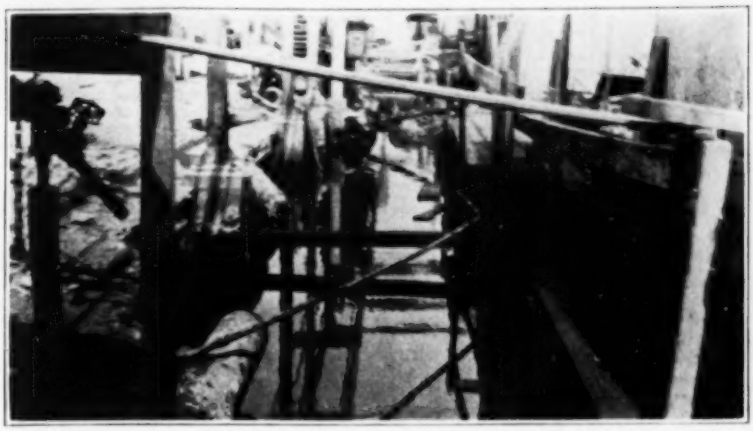
the trench bottom to stabilize the pipe line.

The existence of cross pipe line obstructions proved difficult for the contractor. It was necessary to proceed slowly but cautiously so as not to damage these lines which would disturb existing plant operations.

The problem was overcome by hand excavating a narrow pilot trench ahead of the power shovel, and when an obstruction was encountered, the new sewer was placed beneath the crossing pipe line.

A quarter concrete cradle was installed on a crushed stone sub-base. First a stone bed was laid down in the trench (average 9-foot depth) to stabilize it. A sump was dug below the stone and enough stone put down to assure a dry track.

The contractor was J. R. Fusco, Inc., of Montclair, N. J. He employed a crew of 8 laborers, two men on each machine, with a total working force of 12 under foreman Peter Fumanti.



TYPICAL water conditions encountered in trenching, necessitating bottom stabilization and pipe cradling.

Machinery Employed

Machinery used included: one Bay City 45-foot excavator with 42-inch bucket; one new 12-ton Michigan TLDT-20 truck crane for unloading the pipe from freight car and placing it in the trench; and 1 D-2 Caterpillar bulldozer for the backfilling.

Drainage and dewatering operations required one 3-inch Jaeger centrifugal pump and two 3-inch Carter Humdinger Mudsuckers.

Will There be a "Special" to AWWA Convention?

Read this and help determine the outcome.

For the convenience of those in the east and southeast planning to attend the 1953 AWWA Conference in Grand Rapids, Mich., May 10-15, it is desirable, if possible, to develop a Special Train. Otherwise, passengers from the east and southeast will be inconvenienced by having to change trains enroute early in the morning, and also suffer the nuisance of transfer and baggage handling.

There is a choice of two routes to Grand Rapids provided there is sufficient demand for either route to justify operation of a Special Train. These routes are via New York Central Railroad and Pennsylvania Railroad. Possible schedules are the following.

N.Y. Central Railroad
Train #17

Lv. Boston	2:20 P.M.	Sat. May 9
" N. Y. City	6:10 P.M.	
" Albany	9:04 P.M.	
" Schenectady	9:32 P.M.	
" Utica	10:47 P.M.	
" Rome	11:01 P.M.	
" Syracuse	11:45 P.M.	
" Rochester	1:04 A.M.	Sun. May 10
" Buffalo	2:27 A.M.	
Ar. Grand Rapids.	10:45 A.M.	

Pennsylvania Railroad
Train #49

Lv. Boston	11:00 A.M.	Sat. May 9
" N. Y. City	4:50 P.M.	
" Trenton	5:45 P.M.	
" North Phila.	6:19 P.M.	
" Harrisburg	8:20 P.M.	
" Pittsburgh	1:24 A.M.	Sun. May 10
Ar. Grand Rapids	11:15 A.M.	

In order for either of these trains to operate as "specials," it is essential that reservations be made as quickly as possible. The deadline for determining the advisability of a Special Train is April 1, 1953. Therefore, it is urged (in fact is essential) that all reservation requests be in the hands of AWWA's Transportation Committee prior to that date. Detailed announcements have already been sent all members from A.W.W.A. Headquarters and return postal card included with that announcement should be utilized for requesting reservations. Nonmembers of AWWA who have not received the request card for transportation reservations should advise the Committee by letter of their interest in securing accommodations on a Special Train and choice of route.

All reservations and correspondence on transportation should be addressed to the Chairman of the Transportation Committee rather than to the Association office. Address:

E. A. Sigworth, Chairman
AWWA Transportation Committee
Suite 1333
230 Park Avenue
New York 17, N.Y.

Those from the southeast would normally travel to Cincinnati and thence via Pennsylvania Railroad to Grand Rapids. Unfortunately, the Pennsylvania Railroad train from Cincinnati to Grand Rapids does not operate on Saturday nights. Therefore, it is recommended that those from the southeast desiring to arrive at Grand Rapids on Sunday, May 10, travel to North Philadelphia where they may join the "Special," provided there are a sufficient number of requests for a special train over the Penna. R.R. In many cases travel over this route from the southeast will actually save travel time and the additional transportation cost will be minor.

Since, to secure a special train, a guarantee of not less than 125 passengers is the requirement it behooves everyone interested to notify the AWWA Transportation of such interest as far in advance of the April 1st dead line as possible. We understand that it is permissible to make requests for reservations on a tentative basis, subject to later cancellation if necessary.

Installment buying encourages the buying of things you don't really need, with money you do not have, to impress people you do not like.

REPORT FROM ABROAD

Extension of Treatment Works at York, England, and Micro-straining of Effluent at Luton

by JOHN FINCH, *Manager, Sewage Disposal Department Rotherham, England*

DELEGATES to the Annual Conference of the Institute of Sewage Purification, at Scarborough, visited the City of York (Naburn) Sewage works during the course of the proceedings and were much impressed by the extensions there taking place.

The area draining to these works consists of the whole of the City of York together with some outlying districts, the population served being approximately 110,000. The dry weather flow is 6.1 mgd, all of which is pumped to the sewage works.

York Extensions

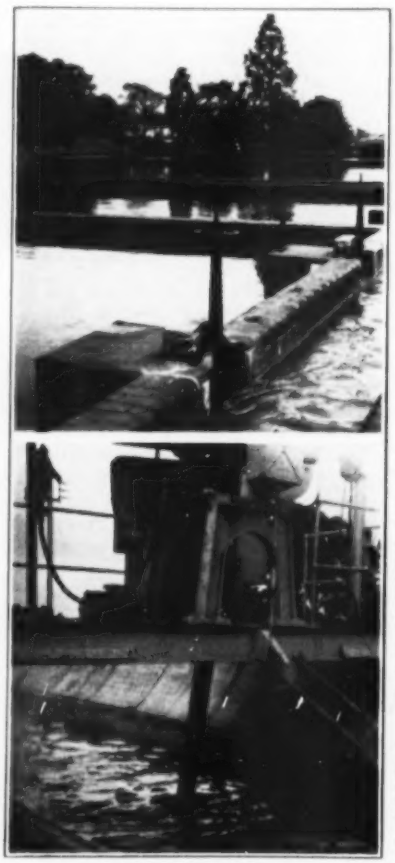
The works at Naburn are essentially of orthodox design, comprising at the present time a plant for the removal of detritus, sedimentation, biological filtration, removal of humus solids, and disposal of all sludge by cold sludge digestion and by drying on under-drained drying beds. A fairly large scheme of extension has been found necessary to deal with the increased flows to the entire satisfaction of the Yorkshire Ouse River Board. This scheme was commenced in 1937 and suspended during the war years—part is now complete, part is progress at the very moment, and part is in process of preparation.

The two existing detritus channels were included for complete reconstruction. One has now been completed and converted to a constant velocity channel equipped with a grit extractor made by the firm of Ames Crosta Mills & Co. Ltd. The second grit channel is in process of construction. This type of channel is flume-controlled downstream and has proved very successful at Naburn. The grit extraction equipment includes a grit-washing mechanism, the grit being retained in a hopper carried on the extractor carriage. The wash liquor is returned to the channel.

The primary settling tanks are of the rectangular horizontal flow type. Based on present flow these have a gross capacity of 9.8 hours. It is intended to extend these tanks.

Secondary Treatment

Two types of percolating filters are in use in this scheme—circular and rectangular—and the present dosage is of the order of 129 gal. per cube yard per day. The construction of further units of percolating filters will increase the capacity (reduce the loading) so that the dosage will be 80 gal. per cubic yard per day.



YORK Treatment Works
Above—primary settling tanks; below—parabolic grit channel and grit extractor

Four rectangular final clarifiers, having a total detention period of 3.5 hours, adequately deal with the present flow of filter effluent. Additional clarifiers of the same type as those already installed will provide similar facilities for the new percolating filter installation.

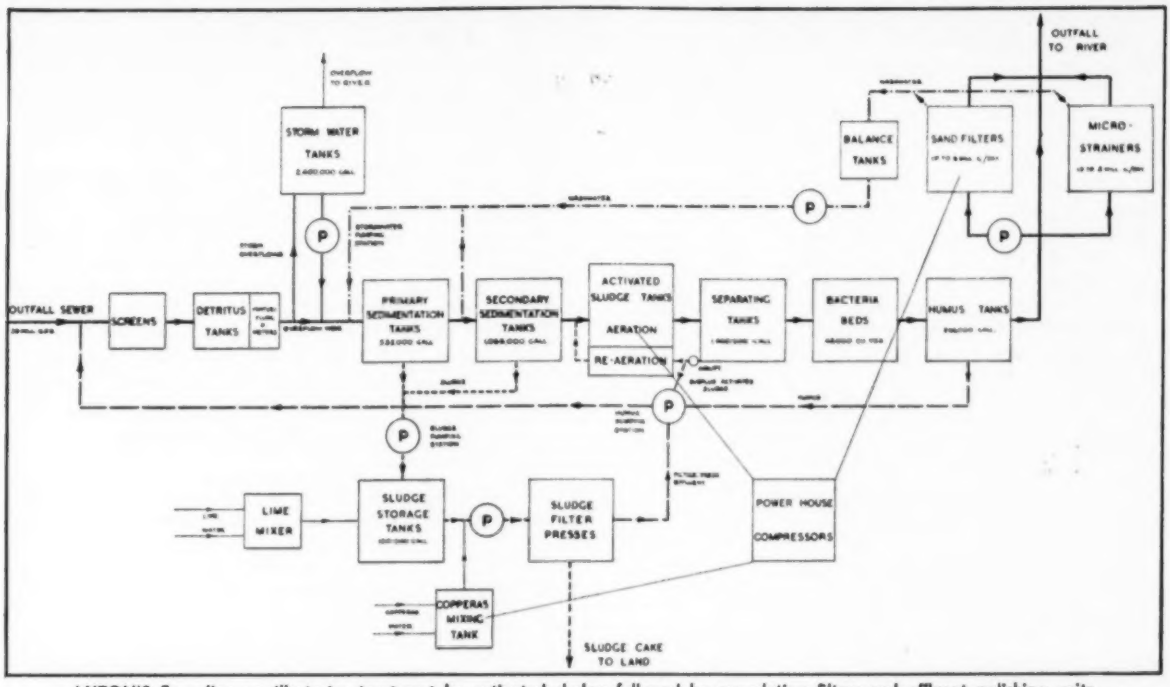
The final effluent from the City of York Sewage works discharges into the River Ouse. At the point of discharge this river is an extremely pleasant stretch of water, and the impression gained during the visit is that the effluent from this works, when completed, is not likely to disturb the rural tranquillity of this famous river.

The Luton Works

Two eagerly awaited events in the sewage treatment field in Great Britain have very recently come to fruition and have given interested parties much food for thought.

In chronological order, the first of these events was the visit of the Metropolitan and Southern Branch of the Institute of Sewage Purification to the Luton Sewage Treatment Works. The second event was the meeting at which a paper was presented giving details of the first twelve months' working of the micro-straining plant and sand-filtration plant, installed at Luton to deal with the final effluent.

Whilst it will not be directly apparent at this stage of this article, it should be stated that most of the interest in the visit to Luton and in the technical contribution, was centered in and around the effluent polishing operation of removing suspended solids from the final effluent. All delegates were keenly concerned with details of a piece of equipment



LUTON'S flow diagram illustrates treatment by activated sludge followed by percolating filters and effluent polishing units

which has now become well-known in the sewage field, through the researches and investigations carried out by the Watter Pollution Research Board of the Department of Scientific & Industrial Research.

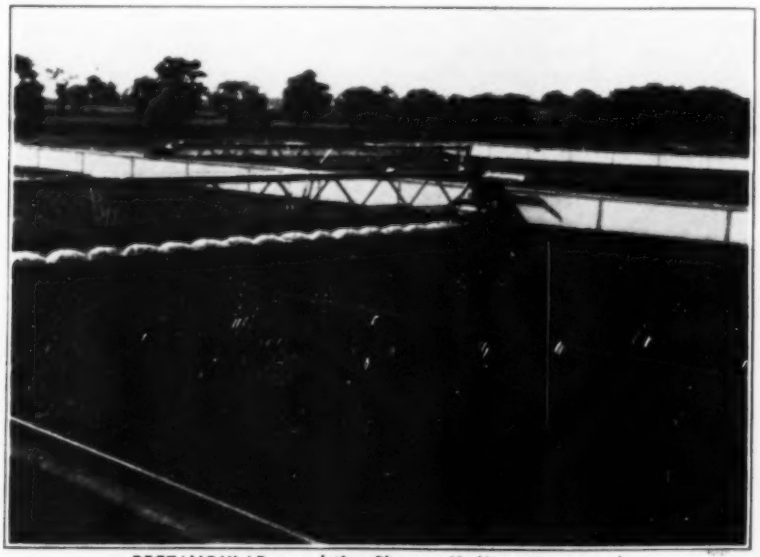
It will not come amiss to give some details of the Luton plant—construction of which commenced in 1938 and continued through the very difficult war years, becoming finally operational in the year 1946—in order to provide some background for the introduction of the micro-straining and sand-filtration plant.

Treatment Units Provided

The raw sewage flowing to the Luton sewage treatment plant is classed as medium to strong. It contains trade wastes from dyeing, chemical, brewery and engineering industries, along with the wastes from Luton's staple industry—the manufacture of hats. The flow is approximately 6.9 mgd from a population of 111,000 persons.

The sewage treatment plant comprises the following units:

Screens: Coarse bar screens.



RECTANGULAR percolating filters at York's treatment works

Grit tanks: Duplicate trapezoidal-sectioned tanks controlled by constant velocity flumes.

Primary settling tanks: Three tanks having a total capacity of 532,000 gal., or 1.8 hr. dry weather flow. These tanks are of the radial flow type and are mechanically desludged. Dimensions of the tanks are 63.5 ft. diameter and 9.5 ft. mean depth.

Secondary settling tanks: These are three in number with a total capacity of 1,068,000 gal. or about 3.75 hr. dry weather flow. Each tank is 106 ft. long by 48 ft. wide and has a mean depth of 11.5 ft. Mechanical desludging is in operation in these tanks, the device being a bridge-type scraper which is designed to serve in turn on all three tanks.

Activated sludge tanks: There are twelve main tanks, each 100 ft. long, 10 ft. wide and 11.5 ft. deep and, in addition, the mixing and feed channels are aerated to give the total aeration capacity of 1 mgd or 3.5 hr. dry weather flow. The channels are so arranged that three or six tanks can be used for re-aerating the returned activated sludge. Air is supplied at the rate of about 0.5 cu. ft. per gallon.

Clarifiers: Six clarifiers, each 58 ft. in diameter with a mean depth of 17 ft., and having a total capacity of 1.4 mg. or 5 hr. dry weather flow, follow the aeration tanks. The tanks are of the upward-flow type with peripheral weirs and mechanically op-

erated scrapers. Sludge is discharged by hydrostatic head.

Percolating filters: The effluent from the activated sludge clarifiers is fed to percolating filters. These are nine in numbers (270 ft. long by 90 ft. wide and with a depth of 6 ft.). The total volume of media is 48,000 cube yards and the dosage to the distributors is at the rate of 140 gal. per cube yard per day. The media is graded clinker of ¾ to 1½ inch size in six of the beds, the other three beds are ungraded clinker of coarser grade.

Humus tanks or final clarifiers: The final stage of the treatment process as originally built consists of humus tanks of which there are nine. Each is 70 ft. long by 30 ft. wide and has an average depth of 27 inches. The total capacity is 266,000 gal. or approximately 1 hr. detention at dry weather flow.

Sludge treatment: It was planned to treat all sludge by the Porteous heat treatment process.

Such was the original design of the sewage treatment plant as actually built. However, not long after the works had been in operation, difficulties were experienced in maintaining a constantly satisfactory effluent. The reasons for this were not easily apparent but probably were due to a combination of circumstances.

Trade Wastes and Sludge Problems

In the first place, the growth of trade wastes was such that they represented a far larger proportion of the total flow than is normally encountered. In the second place, the method of sludge disposal, admirable though it may have been for the conclusive disposal of the solids, had an adverse effect on the rest of the work—owing to the very fractious nature of the returned liquors which were found difficult to treat. Another contributary factor was that of lack of adequate dilution of the effluent in the River Lee.

Mr. Finch's *Report from Abroad* will continue to present facts, observations and opinions of timely interest. The author is Chairman of the North Eastern Branch of the Institute of Sewage Purification, and is a frequent contributor to British technical journals. He will welcome the opportunity of replying personally to readers of *Water and Sewage Works* who have questions or require additional information regarding the subjects discussed.—The Editors.

The position of the town of Luton at the head of the Lee is such that, in view of the small naturally-occurring flow and the uses to which water from the lower river was put, a higher standard of effluent quality is required than would be accepted at many other works; for it must be borne well in mind that a considerable amount of the water in the river finds its way into the raw water intakes of London's Metropolitan Water Board. Incidentally, the River Lee used to be well known for its fishing and was the favorite haunt of the supremo of fishermen—Izaak Walton.

Quite obviously it was beyond the powers of the Luton authority to alter the flow of water in the River Lee upstream of the sewage treatment works, in their efforts to improve river conditions. However, steps were taken to improve the efficiency of the sewage treatment plant and to control the trade wastes included in the public sewer.

The necessity for the Luton authority to produce effluents of a very high order of quality to meet the stringent conditions obtaining in that area, introduced quite a few problems, some of which have acquired almost world-wide publicity in the technical press. This is accounted for by investigations of the Water Pollution Research Board at the plant, and by the "no sooner said than done" attitude of the Luton authority; the latter being only too anxious to act upon the findings of the W.P.R.B. and produce effluents of the best possible quality.

One of the processes that came under consideration in efforts to improve the efficiency of the sewage treatment plant was the sludge treatment and disposal process. The Porteous plant, which unfortunately had an adverse effect on the rest of the works due to the difficult nature of the returned liquors, was abandoned. The sludge presses included in the original equipment were augmented in number and put to use as "straight" sludge presses.

Effluent Finishing Processes

Then experiments were carried out on further treatment of the final effluent and, in this respect, it is interesting to note that ideas were borrowed from current water works practice—micro-straining and sand filtration. These experiments showed that substantial improvements could be made in the effluent and also indicated the best methods of operating these two finishing processes. As no conclusive evidence was given as to which of the processes was likely to give the better results, it was considered necessary to install plants of both types on a large scale. The plants are operated in parallel and together deal with at least the dry weather flow at optimum working conditions.

In the next *Report from Abroad* it is hoped to discuss the findings of Mr. Evans and Mr. Roberts, respectively Manager and Chemist to the Luton Sewage Treatment Authority. Results of their studies were reported in the paper "Twelve Months Operation of Sand Filtration and Micro-Straining Plant at Luton."

EFFLUENT CHARACTERISTICS ILLUSTRATE RESULTS OF IMPROVEMENTS IN THE LUTON PLANT
All data expressed in ppm

Date	4 Hours Oxygen Absorbed.	5-Day B.O.D.	Suspended Solids	Comments
Dec. 1946	21	26	33	Works operating as originally built.
Nov. 1947	19	40	32	
Nov. 1948	21	35	24	
Nov. 1949	14	20	23	Chemical conditioning and pressing of sludge substituted for Porteous Process.
Nov. 1950	13	18	14	Micro-strainers in operation
Nov. 1951	8	6	5	Sand-filters and micro-strainers in operation.
		20	30	Royal Commission Standard for comparison.

Superior, Wis., Will Have to Find Money for Sewage Treatment

Evidently playing for time, the City of Superior, Wisconsin, had gone to court in attempt to void the order of the State Water Pollution Committee. Superior claimed that the Committee had exceeded its authority and that compliance to the extent of expenditure of $2,000,000 for sewage treatment and sewer construction would force the city to exceed the constitutional limitation of debt.

Action brought by Superior was dismissed by the State Supreme Court on grounds that the city had failed to show cause. Regardless of the decision, Superior has most effectively played for time, since the order was issued in 1950.

Contents of Cylindrical Tanks and Standpipes*

Figuring the gallons in a vertical cylindrical tank takes time, and errors are often made in longhand figuring. The accompanying chart quickly gives the number of gallons in a vertical tank of this kind, of ordinary size, and even beyond the ordinary sizes.

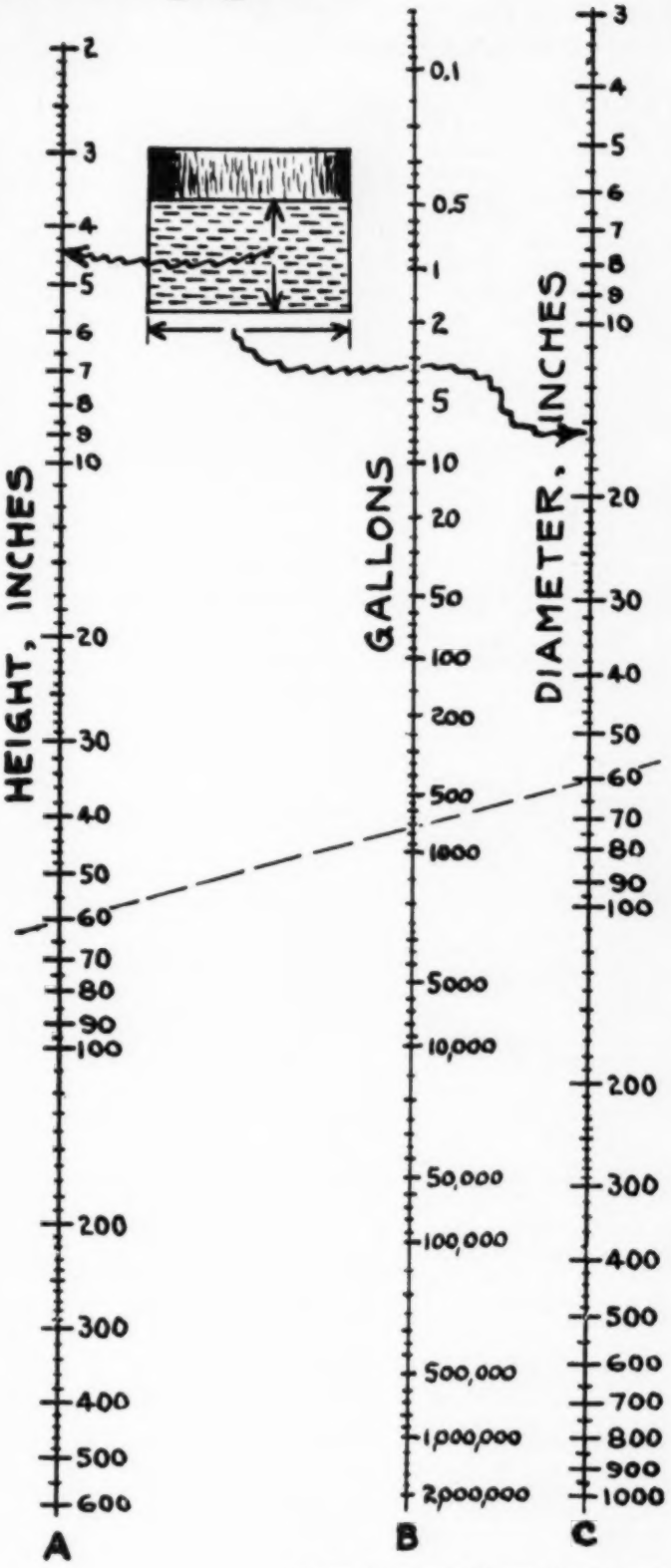
For example, how many gallons will be held by a cylindrical tank 60″ high by 60″ in diameter? The dotted line drawn across the chart shows how it is done. Connect the 60 in the height column (A) with the 60 in the diameter column (C) and the answer is shown in the volume column (B) to be very close to 740 gallons. Figure it out in longhand or on a slide rule and you will find that the answer is 733 gallons, showing that the chart is sufficiently accurate for general use over a wide range of tank sizes.

Inversely the chart may be used to figure the size of tank that will hold a certain number of predetermined gallons. Thus if a tank is wanted to hold 740 gallons, simply run any straight line through the 740 in column (B) and the intersection with column (A) gives the height, an the intersection of the same line with column (C) gives the diameter. By swinging a straight line around the desired point in column (B) the most economical height and diameter combination is readily obtained. As will be observed, there are hundreds and thousands of combinations possible to hold 740 gallons. Also, if we should have a tank 60″ in diameter and, say 200″ high, and it should be desired to pour only 740 gallons into it, the same dotted line drawn across this chart will show that by filling the tank to a height of 60″ it will contain 740 gallons.

The range of the chart, as will be observed, is very great. It will take care of any tank all the way from 2″ in height to 600″ in height, and any diameter from 3″ to 1000″. The maximum capacity of the largest tank is given as 2,000,000 gallons. The chart is based on the U.S. standard of 231 cubic inches per gallon.

Just as an "exercise," what, for instance, must be the dimensions of a tank (can) to hold exactly one gallon? Any line through the "one" in column (B) will give combinations of two dimensions—in fact hundreds of them. One of the combinations will be found to be 6″ high by 7″ in diameter. It will also be found that a flat-shaped tank (can) 3″ high by 10″ in diameter comes very close to having a capacity of one gallon. Or, if 20″ high by 4″ in diameter this combination will hold one gallon. The number of possible combinations is endless.

If the chart is used a few times you will keep it in a convenient place in your work desk.



*Contributed by W. F. Schaphorst, ME., Newark, N.J.

THE EDITOR'S COMMENTS

Credit to the Water Works Fraternity

Ralph Powell

ON a trip to Florida recently one of the first things that greeted my eye was the accompanying picture prominently placed on the front page of the *Miami Herald* in two column width. My first thought was that some water works employee had run amuck in some manner. I purchased a copy of the paper to read the gory details.

Surprise?—Well I'll say, because here to my great delight was the important *Miami Herald* featuring a story of a young water works mechanic who had been rated one of Greater Miami's citizens of the hour. As it turned out, this story was one of a series, being featured by the *Herald*, giving prominence to some of Miami's citizens most deserving of recognition for some good-neighbor deed or some contribution to the good of the community. In other words, a series of stories on some of Greater Miami's citizens of the highest tradition. Well, it was the sort of thing that wins friends for the local water utility, and that would please most any water works man deserving of the name.

It turned out that this young man, a meter repair and maintenance mechanic, is an employee of the Consumers Water Co. of Coral Gables, whose city line abuts that of Miami. First thing upon landing in Miami was a telephone call to Consumer's vice president and general manager, H. E. Keating. After congratulating him and his company on having such an employee as Ralph Powell, I told him that *Water & Sewage Works* expected to take notice of the public relations aspect of Powell's standing in his community and requested a copy of the photograph appearing on page one of the *Miami Herald*. For the photograph and the authorization to reproduce it we are indebted to the editor of the *Herald* and the good offices of Mr. Keating.

A 25-year-old father of three kiddies, Ralph Powell is one of those natural leaders in his community and his church. From teacher of a class of youngsters, at the ripe old age of 25 he has been chosen superintendent of his 66 teacher Sunday School. His hobby being kiddies, he has the whole neighborhood indebted to him as its No. 1 Baby Sitter. In the Water Company and amongst neighbors he has organized a group of blood donors to the armed forces on a rotating schedule of donations.

In addition to the above, Powell was cited for a variety of other good-neighbor acts, but one that stands out has to do with a neighbor's boy who suffers from asthma, a problem which Ralph also had had in earlier years. A specialist in Mississippi had helped young Powell greatly. And, since the neighbors could not afford to send their lad to Mississippi, Ralph Powell is personally making it possible for his young friend to make the trip and obtain the treatment.

So it is,—Ralph Powell, meter repair mechanic for Consumers Water Co., has earned the recognition due the kind of good neighbor that he is. He has rated the front page of the important *Miami Herald;* and, with it all, he has won friends for the local water utility, which in turn can but have the highest regard for a young employee of Ralph Powell's ilk. Would there were hundreds more like him in the water works business; and, along with it, more *"Miami Heralds"* to let the world know about these "Ralph Powells."—L.H.E.

The Fourth Dimension of Treatment Plants

It is often useful to review the past as a guide to the future. By looking back on developments in water supply and sewage disposal, we may acquire a new perspective useful in the years ahead. For this reason, we suggest as recommended reading the review articles by Messrs. Capen and Chase in the January and February issues of this magazine which retrace developments, trends, and problems in this field.

We here call attention to an additional problem, one which is to grow in significance with every passing year: *The Problem of Aging Treatment Plants.* This problem involves the factor of time, the fourth dimension. Time, with a significance all its own, affects the durability and utility of our treatment plants.

Medical science has recognized the special problems of an aging population and much attention is being given to *Geriatrics*—the diseases of old age. This same specialized problem in our aging treatment plants must soon receive the increasing attention of sanitary science.

Today's emphasis is largely upon the design, construction, and operation of new treatment plants. It should be, since the need for new plants continues to be very evident.

As the years pass, old treatment plants continually become older and more numerous. Eventually that time must arrive when the proportion of old treatment plants far outnumbers the new plants. Tomorrow's emphasis, therefore, must be increasingly devoted to maintaining and improving the operation of old plants.

The investment in water and sewage treatment plants is large and will grow much larger. In protecting this investment, we must necessarily be concerned with the matter of timing. Over a period of time, depreciation is continuously and persistently reducing the value of the investment. The natural question is what financial provision is being made to revamp, enlarge or replace these plants, and the equipment involved.

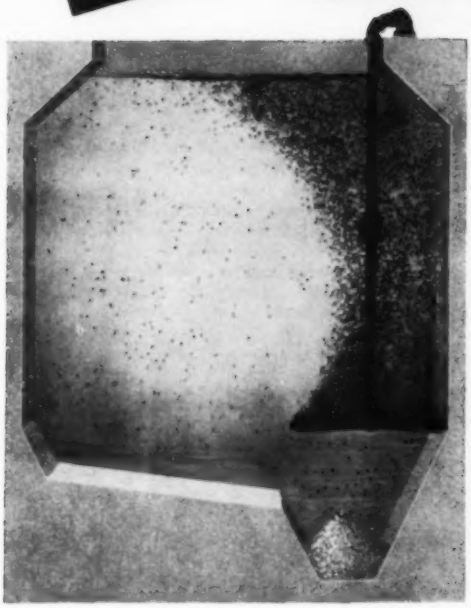
Time not only wears away the treatment plant itself, it also brings new demands which the original plant could not be designed to meet. Populations continue to grow, pollution continues to increase, and new problems continue to appear—each resulting in special handling or treatment problems. The protection of our plant investments will, in time, require specialized modernization.

The "old age diseases" of treatment plants must receive increasing consideration by educators, consultants, plant operators, and funding interests. Equipment manufacturers also will recognize the changing situation as opening a large and different field of opportunity.

New problems present new challenges. This has always been true in the treatment of water, sewage, and industrial wastes. There will be much to learn in solving the problems of aging treatment plants. And, it behooves us to look ahead and plan adequate ways and means of meeting depreciation costs on a pay-as-you-go basis, or provide some other sound method of financing plant replacement or enlargement costs.—H.A.F.

CHICAGO SEWAGE EQUIPMENT

AER-DEGRITTER



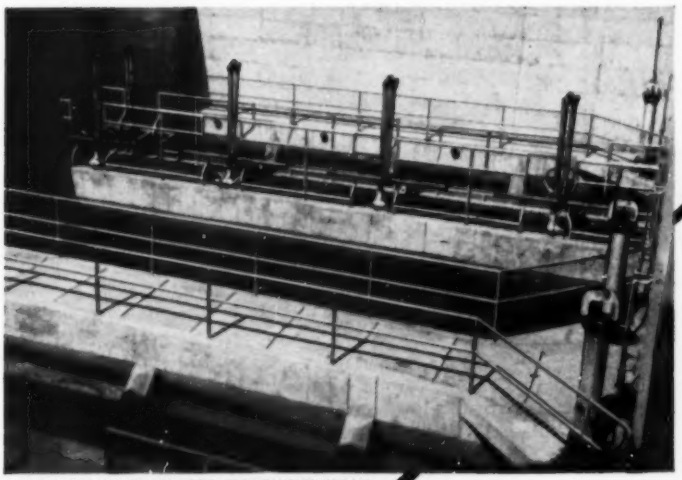
The only method of removing grit and sand from sewage without mechanical equipment is provided by the Aer-Degritter. The velocity of flow is controlled by air introduced through Swing Diffusers and Precision Diffuser Tubes. All sand of 0.2 mm. (65 mesh) and larger is washed and deposited in the bottom of the tank.

Less than 10% volatile matter and only a negligible trace of putrescible organics remains in the grit removed. Aer-Degritters may be installed ahead of all mechanical equipment because coarse sewage material will not interfere with the operation of the Aer-Degritter or affect the hydraulic design of the plant.

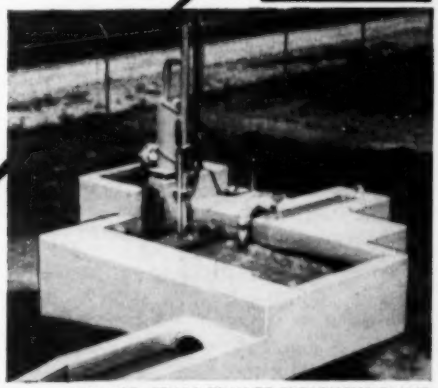
The basic features of the Aer-Degritter are:

- **MAXIMUM REMOVAL**
- **CLEAN GRIT**
- **NO MECHANISM**
- **LOW COST**
- **SIMPLE STRUCTURE**
- **AIR CONTROLLED VELOCITIES INDEPENDENT OF FLOW**

52 INSTALLED IN TWO YEARS



COLUMBUS OHIO SEWAGE TREATMENT PLANT
Design Flow 160 M.G.D.
PAUL A. UHLMANN & ASSOCIATES
Consulting Engineers



BELLAIRE, TEXAS SEWAGE TREATMENT PLANT
Design Flow .8 M.G.D.
HILTON & COULSON
Consulting Engineers

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View of a recently completed sewage plant at Texas City, Texas, taken from the bridge of the 54-ft. diameter Primary Spiraflo Clarifier, and showing the 98-ft. diameter filter, the 54-ft. diameter Final Spiraflo Clarifier and the floating-cover digester.

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Name.....Title.....

Address.....

Meetings Scheduled

Mar. 8-12—College Station, Texas *(Texas A. & M. College)*
TEXAS WATER WORKS & SEWERAGE ASSOCIATION. (Annual Meeting.) Sec'y, V. M. Ehlers, State Dept. of Health, Austin, Texas.

Mar. 11-13—Atlantic City, N.J. *(Traymore Hotel)*
NEW JERSEY SEWAGE & IND. WASTES ASSOCIATION. Sec'y, M. S. Kachorsky, Box 766, Manville, N.J.

Mar. 16-18—Little Rock, Ark. *(Hotel Marion)*
ARKANSAS WATER & SEWAGE CONFERENCE. Sec'y, Dr. Harrison Hale, Southern State College, Magnolia, Ark.

Mar. 18-19—Baton Rouge, La. *(Louisiana State Univ.)*
SHORT COURSE FOR WATER & SEWERAGE DEPT. PERSONNEL. (Examinations for Certificates Mar. 20.) Director, John H. O'Neill, Dept. of Health, Civil Courts Bldg., New Orleans, La.

Mar. 18-20—Chicago, Ill. *(LaSalle Hotel)*
ILLINOIS SECTION A.W.W.A. Sec'y, J. Leslie Hart, 122 S. Michigan Avenue, Chicago, Ill.

Mar. 19—Cambridge, Mass. *(Hotel Continental)*
NEW ENGLAND SECTION A.W.W.A. Sec'y, G. G. Bogren, 14 Beacon Street, Boston, Mass.

Mar. 19—Cambridge, Mass. *(Hotel Continental)*
NEW ENGLAND WATER WORKS ASS'N. Sec'y, Jos. C. Knox, 73 Tremont St., Boston, Mass.

Mar. 19-20—Chapel Hill, N.C. *(Univ. of No. Carolina)*
SECOND SOUTHERN MUNICIPAL & IND. WASTE CONFERENCE. (Sponsored by Duke Univ., Univ. of N.C. & N.C. State College.) Arrangements Chmn., Dr. Daniel A. Okun, Assoc. Prof. of San. Eng., Univ. of North Carolina, Chapel Hill, N.C.

Mar. 23-25—Macon, Ga. *(Hotel Dempsey)*
SOUTHEASTERN SECTION A.W.W.A. Sec'y, T. A. Kolb, Wade Hampton Bldg., Columbia, Ga.

Apr. 2-4—Spartanburg, S.C. *(Clemson College)*
SOUTH CAROLINA WATER & SEWAGE WORKS ASSOCIATION. Sec'y, W. T. Linton, Wade Hampton Bldg., Columbia, S.C.

Apr. 6-8—Buffalo, N.Y. *(Hotel Statler)*
CANADIAN SECTION A.W.W.A. Sec'y, Dr. E. Berry, Ontario Dept. of Health, Parliament Bldgs., Toronto, Ont.

Apr. 15—Livermore Falls, Me.
MAINE WATER UTILITIES ASSOCIATION. Sec'y, Earle A. Tarr, 15 Bowdoin St., Winthrop, Me.

Apr. 16-17—Lincoln, Neb. *(Cornhusker Hotel)*
NEBRASKA SECTION A.W.W.A. Sec'y, E. Bruce Meier, Dept. Civil Eng., Univ. of Nebraska, Lincoln, Neb.

Apr. 16-17—Elmira, N.Y. *(Mark Twain Hotel)*
NEW YORK SECTION A.W.W.A. (Spring Meeting). Sec'y, Rollo K. Blanchard, 50 West 50th Street, N. Y. 20, N.Y.

Apr. 16-18—Chandler, Ariz. *(Hotel San Marcos)*
ARIZONA SECTION A.W.W.A. Sec'y, M. V. Ellis, 46 W. Encanto Blvd., Phoenix, Ariz.

Apr. 16-18—Chandler, Ariz. *(San Marco Hotel)*
ARIZONA SEWAGE & WATER WORKS ASSOCIATION. Sec'y, M. V. Ellis, Sewage Treatment Plant, Phoenix, Ariz.

Apr. 16-18—Portland, Ore. *(Multnomah Hotel)*
PACIFIC NORTHWEST SECTION A.W.W.A. Sec'y, O. P. Newman, Boise Water Corp., Boise, Idaho.

Apr. 22-24—Wichita, Kans. *(Hotel Broadview)*
KANSAS SECTION A.W.W.A. Sec'y, Harry W. Badley, 119 W. Cloud, Salina, Kans.

Apr. 22-24—Wichita, Kans. *(Hotel Broadview)*
KANSAS SEWAGE & IND. WASTES ASSOCIATION. Sec'y, D. F. Metzler, Marvin Hall, Univ. of Kansas, Lawrence, Kans.

Apr. 22-25—Santa Barbara, Calif. *(Mar Monte Hotel)*
CALIFORNIA SEWAGE & IND. WASTES ASSOCIATION. Sec'y, Sam A. Weed, Room 315, City Hall, Oakland 18, Calif.

Apr. 23—Kalispell, Mont. *(Kalispell Hotel)*
MONTANA SEWAGE WORKS ASSOCIATION. Sec'y, Harvey W. Taylor, State Board of Health, Helena, Mont.

Apr. 24-25—Kalispell, Mont. *(Kalispell Hotel)*
MONTANA SECTION A.W.W.A. Sec'y, A. W. Clarkson, State Board of Health, Helena, Mont.

May 4-6—Layfayette, Ind. *(Purdue Memorial Union Bldg.)*
EIGHTH PURDUE INDUSTRIAL WASTE CONFERENCE. Chairman, Prof. Don E. Bloodgood, Purdue Univ., Lafayette, Ind.

May 10-15—Grand Rapids, Mich. *(Exhibits and Technical Sessions—Auditorium. Hotels—Various*)*
AMERICAN WATER WORKS ASSOCIATION (73rd Annual Convention). Exec. Sec'y, Harry E. Jordan, 521 Fifth Ave., New York 17, N.Y.
*(*For reservations apply A.W.W.A. Office)*

May 21-22—Richmond, Va. *(Hotel Jefferson)*
VIRGINIA INDUSTRIAL WASTES & SEWAGE WORKS ASSOCIATION. Sec'y, J. L. Hamrich, Jr., 415 W. Franklin St., Richmond, Va.

June 3-5—Peoria, Ill. *(Hotel Pere Marquette)*
CENTRAL STATES SEWAGE & IND. WASTES ASSN. Sec'y, A. P. Troemper, Ill. Water Board, Springfield, Ill.

June 10—Bath, Me.
MAINE WATER UTILITIES ASSOCIATION. Sec'y, Earle A. Tarr, 15 Bowdoin St., Winthrop, Me.

June 10—Martinsville, N.J. *(Martinsville Inn)*
NEW JERSEY SECTION A.W.W.A. (Summer Outing & Inspection of Johns-Manville Research Center, Finderne, N.J.—Luncheon at Inn). Sec'y, C. B. Tygert, Box 178, Newark 1, N.J.

June 17-19—Hershey, Pa. *(Hotel Hershey)*
PENNSYLVANIA SECTION A.W.W.A. Sec'y, L. S. Morgan, Dept. of Health, Greensburg, Pa.

June 17-19—Akron, O. *(Mayflower Hotel)*
OHIO SEWAGE & INDUSTRIAL WASTES TREATMENT CONFERENCE. Sec'y, Ward E. Conrad, 301 Ohio Dept. Bldg., Columbus, O.

June 18—York Harbor, Me. *(Marshall House)*
NEW ENGLAND WATER WORKS ASSOCIATION (June Conference). Sec'y, Jos. C. Knox, 73 Tremont St., Boston, Mass.

June 29-July 3—Atlantic City, N.J. *(Hotels Chalfonte and Haddon Hall)*
AMERICAN SOCIETY FOR TESTING MATERIALS. Sec'y, R. E. Hess, 1916 Race St., Philadelphia, Pa.

Aug. 12—Sanford, Me.
MAINE WATER UTILITIES ASSOCIATION. Sec'y, Earle A. Tarr, 15 Bowdoin St., Winthrop, Me.

Aug. 24-26—State College, Pa.
PENNSYLVANIA WATER WORKS OPERATORS ASSN. Sec'y, R. R. Kountz, Penna. State College, State College, Pa.

Aug. 26-28—State College, Pa.
PENNSYLVANIA SEWAGE & INDUSTRIAL WASTES ASSN. Sec'y, B. S. Bush, Dept. of Health, Kirby Health Center, Wilkes-Barre, Pa.

Sept. 1-5—Winnipeg, Can. *(Royal Alexandria)*
MINNESOTA SECTION A.W.W.A. Sec'y, L. N. Thompson, Water Department, St. Paul 2, Minn.

Sept. 10-11—Lake Placid, N.Y. *(Lake Placid Club)*
NEW YORK SECTION A.W.W.A. Sec'y, R. K. Blanchard, 50 West 50 St., New York, N.Y.

Sept. 10-11—Cleveland, O. *(Hotel Cleveland)*
OHIO SECTION A.W.W.A. Sec'y, M. E. Druley, Dayton Power & Light Co., Wilmington, Ohio.

Sept. 21-23—Owensboro, Ky. *(Owensboro, Hotel)*
KENTUCKY-TENNESSEE INDUSTRIAL WASTES & SEWAGE WORKS ASSOCIATION. Sec'y, R. Paul Farrell, 420 Sixth Ave. N., Nashville 3, Tenn.

Sept. 21-23—Owensboro, Ky. *(Hotel Queensboro)*
KENTUCKY-TENNESSEE SECTION A.W.W.A. Sec'y, J. W. Finney, 420 6th Ave. N., Nashville, Tenn.

Sept. 22-24—Milwaukee, Wis. *(Hotel Pfister)*
WISCONSIN SECTION A.W.W.A. Sec'y, L. A. Smith, City Hall, Madison 3, Wis.

Sept. 23-25—Edmonton, Alberta *(Macdonald Hotel)*
WESTERN CANADA WATER & SEWAGE CONFERENCE. (Operators' School Sept. 23). Sec'y, W. J. Waddell, 617-7th Ave. East, Calgary, Alberta.

(*Continued on page 92A*)

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Meetings Scheduled

(*Continued from page 91A*)

Sept. 28-30—Poland Spring, Me. *(Poland Spr. House)*
NEW ENGLAND WATER WORKS ASSOCIATION (72nd Annual Convention). Sec'y, Jos. C. Knox, 73 Tremont St., Boston, Mass.

Oct. 4-6—Jackson, Miss. *(Hotel Heidelberg)*
ALABAMA-MISSISSIPPI SECTION A.W.W.A. Sec'y, Chas. W. White, State Dept. Health, 537 Dexter Ave., Montgomery, Ala.

Oct. 13-16—Miami, Fla. *(Municipal Auditorium)*
FEDERATION OF SEWAGE & INDUSTRIAL WASTES ASSN. (26th Annual Meeting). Exec. Sec'y, W. H. Wisely, 325 Illinois Bldg., Champaign, Ill.
(joint Meeting with)
FLORIDA SEWAGE & INDUSTRIAL WASTES ASSOCIATION. Sec'y, D. P. Schiesswohl, P.O. Box 210, Jacksonville, Fla.

Oct. 14—Rumsford, Me.
MAINE WATER UTILITIES ASSOCIATION (Annual Meeting). Sec'y, Earle A. Tarr, 15 Bowdoin St., Winthrop, Me.

Oct. 14-16—Waterloo, Iowa *(Hotel Russell Lamson)*
IOWA SECTION A.W.W.A. Sec'y, H. V. Pedersen, Municipal Bldg., Marshalltown, Iowa.

Oct. 18-21—Houston, Tex. *(Rice Hotel)*
SOUTHWEST SECTION A.W.W.A. Sec'y, L. A. Jackson, Robinson Auditorium, Little Rock, Ark.

Oct. 19-24—New York, N.Y.
AMERICAN SOCIETY OF CIVIL ENGINEERS (Annual Meeting). Sec'y, Wm. N. Carey, 33 W. 29 Street, New York 18, N.Y.

Oct. 20-23—Atlantic City, N.J. *(Chalfonte Hotel)*
PENNSYLVANIA WATER WORKS ASSOCIATION. Sec'y, W. A. Kufs, 510 Telegraph Bldg., Harrisburg, Pa.

Oct. 22-24—Atlantic City, N.J. *(Madison Hotel)*
NEW JERSEY SECTION A.W.W.A. Sec'y, C. B. Tygert, Box 178, Newark 1, N.J.

Oct. 27-30—San Francisco, Calif. *(Palace Hotel)*
CALIFORNIA SECTION A.W.W.A. Sec'y, J. C. Luthin, 1113 Laurent St., Santa Cruz, Calif.

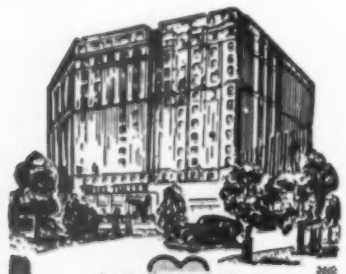
Oct 28-30—Wilmington, Del. *(Hotel DuPont)*
CHESAPEAKE SECTION A.W.W.A. Sec'y, C. J. Lauter, 6955 33rd Street, Washington 15, D.C.

Nov. 4-6—Roanoke, Va. *(Hotel Roanoke)*
VIRGINIA SECTION A.W.W.A. Sec'y, W. H. Shewbridge, 708 State Office Bldg., Richmond 19, Va.

Nov. 12-13—Lincoln, Neb. *(Hotel Capitol)*
NEBRASKA SEWAGE & INDUSTRIAL WASTES ASSOCIATION. Sec'y, Paul W. Mousel, 602 W. B. Street, McCook, Neb.

Nov. 8-13—New York, N.Y.
AMERICAN PUBLIC HEALTH ASSOCIATION. Sec'y Mrs. W. R. Walsh, A.P.H.A. 1790 Broadway, New York, N.Y.

Dec. 9—Waterville, Me.
MAINE WATER UTILITIES ASSOCIATION. Sec'y, Earle A. Tarr, 15 Bowdoin St., Winthrop, Me.



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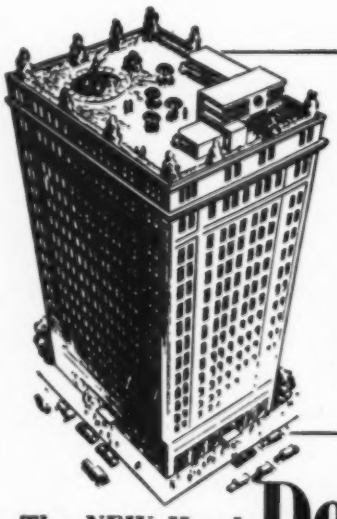

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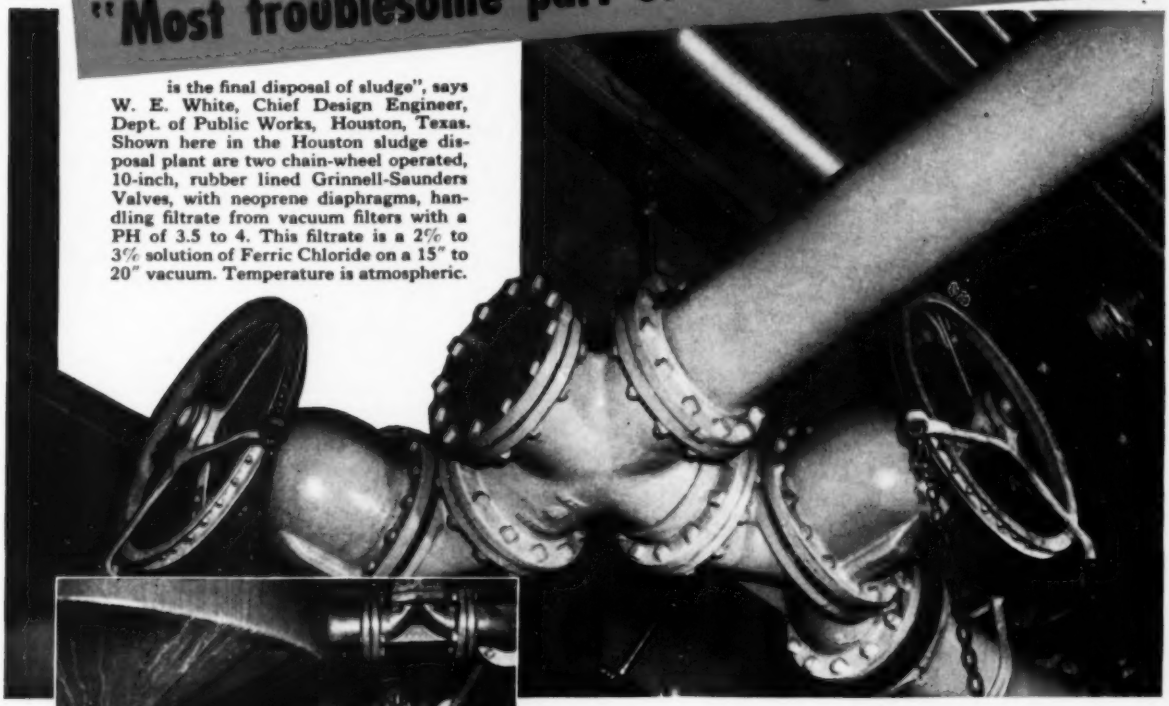
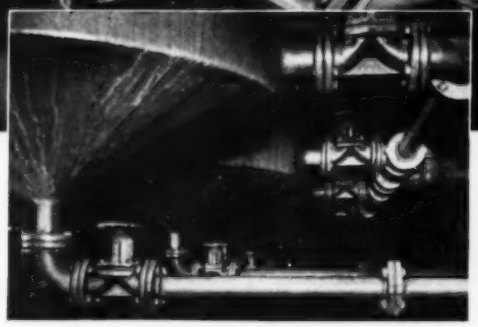
is the final disposal of sludge", says W. E. White, Chief Design Engineer, Dept. of Public Works, Houston, Texas. Shown here in the Houston sludge disposal plant are two chain-wheel operated, 10-inch, rubber lined Grinnell-Saunders Valves, with neoprene diaphragms, handling filtrate from vacuum filters with a PH of 3.5 to 4. This filtrate is a 2% to 3% solution of Ferric Chloride on a 15" to 20" vacuum. Temperature is atmospheric.





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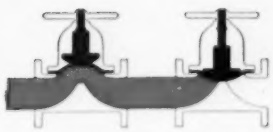

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New Footings Required at Milwaukee Plant

The Milwaukee Sewerage Commission has operated a program since the summer of 1952 to prevent further settling of buildings at the Jones Island disposal plant. Crews have been busy drilling holes in foot thick concrete floors and pumping hundreds of tons of wet cement and sand into them to fill up voids as much as three feet deep.

The earth beneath the floors has settled that much since the structures were built 27 years ago. In many places it has left parts of the buildings without support.

Ordinarily the settlement of the earth would not have been too serious, but in this case the ground water level dropped seven feet, exposing to dry rot the hundreds of piles that support the buildings. The timber piles were so badly rotted, it was found, that chunks could be torn from them by hand.

So far, 3,875 holes have been drilled into the floor. Into these holes wet cement and sand were pumped under pressure. That mixture was used so it would flow into all the vacant spaces under the building. At each hole the pumping continued until the cement came out another hole near by, indicating that the voids beneath had been filled.

Raymond D. Leary, chief engineer of the commission, reported that 75% of the filling had been completed and that the job would be finished before summer.

Filling of the empty spaces beneath the floors and foundations will not be enough, however.

"We plan to install a water system, controlled by float type stop valves, to restore the ground water level," he said. "The water will be pumped beneath the buildings and allowed to saturate the ground until the proper level has been restored. After that the valves will control the flow, always maintaining a level that will prevent further deterioration of remaining serviceable piles."

when you need it!

When dangerous vacuum conditions occur in flow lines, the PELTON Air Valve opens *rapidly* because the dashpot oil is by-passed through a check valve in the piston. Rate of closing is adjustable to hydraulic conditions in the line to *slowly* cushion final closure. Let experienced PELTON engineers show you how the PELTON Automatic Slow-Closing Air Valve used in combination with the patented PELTON Surge Suppressor achieves the ultimate in flow line protection.

THE PELTON *Automatic Slow-Closing* AIR VALVE

THE PELTON WATER WHEEL COMPANY
A Subsidiary of Baldwin-Lima-Hamilton Corporation
2929 Nineteenth Street • San Francisco 10, California

Chicago Consolidates Water and Sewer Departments In Reorganization

DeBerard, Chief Water Engr. & Deputy Comm.; Gerstein Asst. Chief Garry Heads Bureau of Sewers Van Gorp, Chief of New Bureau of Engineering.

A new and completely separate Department of Water and Sewers has been created by the City of Chicago to take over all activities in connection with the operation and maintenance of Chicago's Water Works and Sewer Systems which were formerly in the Dept. of Public Works. Activities pertaining to the design and construction of water works, sewers, bridges, etc., remain in the Dept. of Public Works in the newly formed Bureau of Engineering. Design and construction of the water distribution system will, however, be retained in the Water Distribution Div. in the Dept. of Water and Sewers now comprised of the Bureau of Water and Bureau of Sewers.

Hon. James W. Jardine has been appointed Commissioner of Water and Sewers, in charge of the new Department.

Bureau of Water

The Bureau of Water is under the direction of W. W. DeBerard, as

Deputy Commissioner and Chief Water Engineer. Mr. DeBerard will act as Commissioner of Water and Sewers in the absence of the Commissioner. Previous to the change, Mr. DeBerard was City Engineer, in charge of the former Bureau of Engineering.

H. H. Gerstein has been appointed Ass't to the Chief Water Engineer. Mr. Gerstein was formerly Chief Filtration Chemist in charge of the South District Filtration Plant.

John Elger has been appointed General Secy. in charge of the Office of the Chief Water Engineer, Room 402, City Hall.

The Bureau of Water is comprised of the following Divisions:

WATER COLLECTION DIV.—Joseph F. Higgins, Superintendent.

WATER PURIFICATION DIV.—John R. Baylis, Engineer in Charge; Oscar Gullans, Chief Filtration Chemist; James Vaughn, Director of Filtration Laboratories; Nicholas Kuehn, Engr. in Chg. of Water Safety Control.

OPERATING DIV.—James L. Weeks, Engr. in Charge.

WATER DISTRIBUTION DIV.—Bernard W. Cullen, Superintendent; John T. Garrity, Assistant Supt.; Justus B. Eddy, Engr. of Main Extensions.

METER DIV.—Mark I. Sheridan, Superintendent.

Bureau of Sewers

The Bureau of Sewers is under the direction of Deputy Commissioner for Sewers, Thomas D. Garry. Mr. Garry was formerly Sup't of Sewers.

A. J. Schafmayer, as Chief Eng. of Sewers and Harry Forrey is Ass't Chief Eng.

Bureau of Engineering

The new Bureau of Engineering will perform the planning, engineering design and construction of all capital improvements. It is headed by Dick Van Gorp, Chief Engineer, who was formerly Chief Engineer of the Department of Subways and Superhighways. Under him are the following three Assistant Chief Engineers.

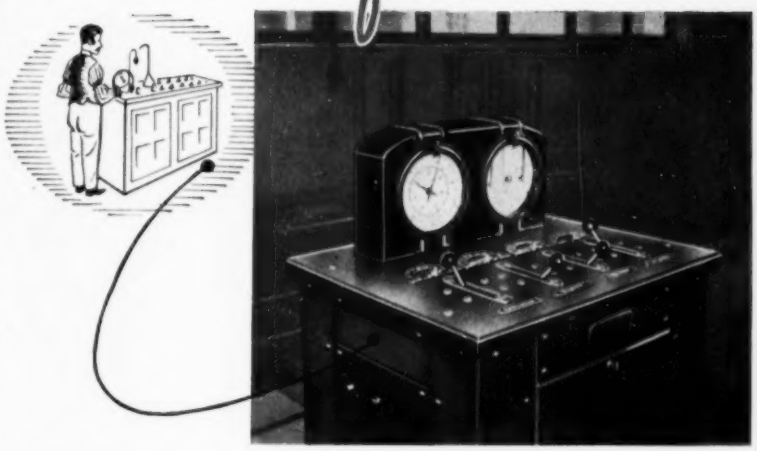
Walter E. Rasmus is Engr. in charge of Design; J. Walter Grimm, Engr. in Charge of Construction; Fred G. Gordon, Administrative Engr.*

The following comprise the Divisions of the new Bureau of Engineering.

WATER DESIGN DIV.—O. B. Carlisle, Chief. FILTRATION DESIGN DIV.—George S. Salter, Chief. SEWER PLANNING DIV.—A. L. Tholin, Chief. SEWER CONSTRUCTION DIV.—Roy Kloman, Engineer in Chg. WATER WORKS CONSTR. DIV. — Ernst Stromback, Engineer in Chg.; Carl Riggenbach, Asst. Engr. in Chg.

*Formerly Asst. City Engr.

an AMERICAN *first!*



AMERICAN Operating Tables
***still in use after* FIFTY YEARS**

American Operating Tables offer the filtration plant many features that are designed to simplify the control of large filtering operations. With electric or hydraulic operation of the many large valves in the modern plant, American Operating Tables not only assure easy control of the filtering process, but are designed to present a neat, pleasing appearance to visitors.

Some of the advantages of American Operating Tables are:

LONG LIFE—American Operating Tables are built of slate bolted to a steel frame, with all valves and connections of bronze or brass to reduce any possibility of corrosion. Many tables have been in constant operation for half a century.

SIMPLIFIED OPERATION—All operating levers, wheels and indicators on American Operating Tables are arranged to simplify the operator's job. American improvements in positioning controls have reduced the required attendants in a filtration plant to the minimum.

ATTRACTIVE APPEARANCE—Gauges, pointers and other metal parts showing on the table are chrome plated bronze or brass, presenting a pleasing appearance, against the dark blue slate panels to visitors passing through the plant.

American has specialized in solving the problems of water conditioning for over half a century, and Municipal plants the world over are proof of soundness of American designs and engineering. Why not call on our engineers for the solution to your water problem, or write today.

SERVICE SINCE 1902 — AMERICAN SYSTEM W A S C PATENTED — TO THE INDUSTRY

AMERICAN *Water Softener* COMPANY
INCORPORATED

FOURTH AND LEHIGH AVENUE • PHILADELPHIA 33, PENNSYLVANIA

DEAERATORS • HOT PROCESS SOFTENERS • REACTORS • FILTERS • ZEOLITE SOFTENERS • CHLORIDE DEALKALIZERS • AERATORS & DEGASIFIERS
HYDROGEN SODIUM ZEOLITE SOFTENERS • DEMINERALIZERS • CHEMICAL FEEDERS • CONTINUOUS BLOWDOWN • SWIMMING POOL EQUIPMENT

KRALOY
PIPE & FITTINGS

COMPLETE
DISTRIBUTION SYSTEMS

MAINS, SADDLES, SERVICES

No Corrosion!

Kraloy will not rust, is impervious to all types of soils, and is not subject to galvanic corrosion.

Low-Cost Installation

No welding or field wrapping is necessary. Installations are simple, rapid, inexpensive.

No Maintenance

Properly installed Kraloy systems eliminate all maintenance causes except damage by excavating equipment.

- LIGHT-WEIGHT. Easier to handle. 8 times lighter than steel, 15 times lighter than copper.
- TRANSPARENT. Permits visual inspection of joints.
- GREATER CARRYING CAPACITY. Smooth, frictionless. Can carry 20% more than steel pipe.
- NON-TOXIC. Does not impart a taste to water.

Kraloy is the most experienced manufacturer of plastic pipe and fittings for underground water lines. Kraloy in use by over 100 water utilities.

STOCKED BY

Crane Co. • Howard Supply Co.
National Supply Co. • HOMCO
Mine Supply Co.

Write for technical data and installation details

Kraloy Plastic Pipe Co., Inc.
4710 East Washington Boulevard
Los Angeles 22, California
Gentlemen: Please send me complete information on Kraloy Pipe and Fittings.

NAME_____
FIRM_____
STREET_____
CITY_____ ZONE____ STATE_____

Plastic Water Pipe: Is It Non-Toxic?

Study being conducted by National Sanitation Foundation in its Second year

The research evaluation study on extruded thermoplastic pipe being conducted by the National Sanitation Foundation, whose headquarters are at the University of Michigan's School of Public Health in Ann Arbor, has entered its second year of operation, according to Walter D. Tiedeman, Director of the NSF Testing Laboratory.

This project, sponsored by the Society of the Plastics Industry, is to evaluate the non-toxicity of plastic pipe in the underground transmission of water.

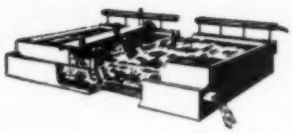
Plastics raw materials now undergoing tests to assure complete health safety in water transmission include polyethylene, polystyrene, cellulose acetate butyrate, and copolymers of polyvinyl chloride.

The work to date, according to Mr. Tiedeman, has involved a study of the possible action of various types of "aggressive" natural waters in extracting favorable or unfavorable substances from plastic pipe.

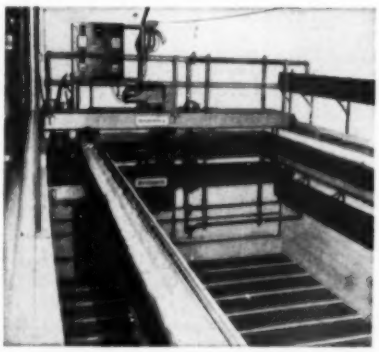
Long-range critical studies are about to begin in which various types of aggressive waters are to be exposed for long periods of time to different plastics in self-contained circulating systems of plastic pipe. This water will then be frozen into ice cubes for storage and later use in scientific feeding experiments to assure safety from a health point of view.

The National Sanitation Foundation is a non-profit, non-commercial organization designed to bring indus-

"Well, the specs called for bedding under the pipe through this stretch."



investigate the
AUTOMATIC BACKWASH RAPID SAND FILTER

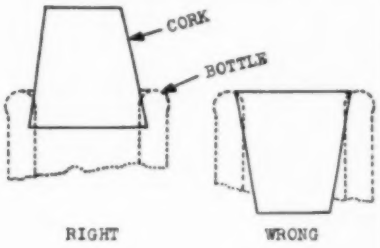


The Hardinge "ABW" Sand Filter cleans itself, automatically, without shut-downs or change-over. Primarily adapted to the filtering of water containing small amounts of suspended particles that cannot be properly collected in settling basins or classifiers. Used for filtering municipal water supplies, industrial water supplies, sewage plant effluents, and certain pre-settled industrial waste waters to permit their re-use. Bulletin 46-A-15.

HARDINGE
COMPANY INCORPORATED
YORK, PENNSYLVANIA—240 Arch St. Main Office and Works
NEW YORK 17 • SAN FRANCISCO 11 • CHICAGO 6 • HIBBING, MINN. • TORONTO 1
122 E. 42nd St. 24 California St. 205 W. Wacker Dr. 2016 First Ave. 200 Bay St.

trial, business and public health officials together on a nation-wide basis to solve sanitation problems of mutual and public concern. It is entirely supported by industry. There are 24 plastics industry companies supporting the present study.

The plastic pipe study is one of several now being carried on by the Foundation through its separately incorporated Testing Laboratory, which offers a seal of approval for equipment and material having a health connotation in its use and meeting NSF sanitation standards established voluntarily by industry and public health officials.



A Good "Corking Kink"*

When a cork is too small for a proper fit in the neck of a bottle, as on the right in the accompanying sketch, the kink on the left solves the problem. The cork that is found to be too small can frequently be used to just as good effect when turned upside and the large end is squeezed into the bottle neck. By so doing you have most of the cork outside of the bottle neck, making for ease in removal and re-insertion. The inverted cork will make as tight a fit as a cork of the proper size inserted with the small end down.

* Contributed by W. F. Schaphorst, M.E., Newark, N.J.

Pickups from "Sanitary Engineering News"

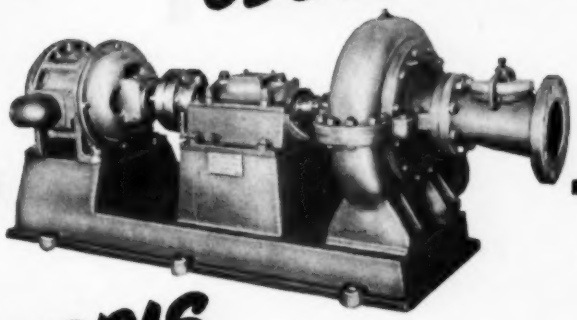
Don E. Bloodgood, Editor

The water reservoir at Austin, Nev., was imperiled by a swarm of crickets 25 miles wide and 14 miles long. Frantic workers spread forty tons of poisoned barley and halted the invasion a quarter mile from the reservoir!

* * *

A preliminary test of a method of locating "lost" sewers with radium was recently conducted at Manitou Springs, Colo., and the test was characterized as "successful." The test was made by dropping a radium needle worth $4,000 down into a sewer on the end of a cord and then

Even large solids pass WITHOUT CLOGGING!



MORRIS CENTRIFUGAL PUMPS

Specially designed to withstand tough operating conditions in any sewage plant.

Despite the severe operating conditions which occur in some sewage plants, the Morris Pumps continue to function dependably, efficiently and economically.

Morris Pumps will handle long, stringy, fibrous materials. Extensive experience in handling mixtures containing abrasive solids enables Morris to design for moderate quantities of grit, without undue impairment. Operation under abnormal conditions such as these prove unquestionably the rugged, superior construction of Morris Pumps.

Morris Pumps are Easily Installed... Easily Maintained... Easily Dismantled

Both the casing and the suction nozzle have hand holes . . . and the construction of the pump permits easy dismantling.

The castings are heavy. And the pumps are mechanically and hydraulically designed for greater resistance to abrasion.

Both the horizontal and vertical Morris Pumps are available in sizes ranging from 3" to 20" and adaptable to all types of drives.

Every pump is backed by 84 years' experience . . . carefully and practically tested for high sustained efficiency at low operating cost.

America's Largest Cities are Now Using Morris Centrifugal Pumps for More Dependable Service

Morris Machine Works, Baldwinsville, N. Y.
Offices in Principal Cities

MORRIS Centrifugal Pumps

locating the course of the needle as it floated through the sewer. Geiger counters were used on the surface of the ground to trace the movement of the precious radium.

* * *

Estimates based on current consumption of phosphates in the formulation of synthetic detergents and water softeners indicate that the average content of phosphorus in domestic sewage has doubled in the past six years.

* * *

Garbage discharged with sewage into septic tanks is reported to increase the clogging effect on soils in the absorption field. Housing Research Paper 18, Housing and Home Finance Agency, Office of the Administrator, Division of Housing Research.

* * *

Baden-Baden, Germany uses a method of composting of sand-bed sludge to produce a material suitable for fertilizer.

* * *

Contracts for the construction of 111 sewage treatment projects were awarded during the first quarter of 1952.

Selective bioassays have shown that the minimum lethal concentrations of sulfides to certain susceptible fish is between .5 and 1.0 ppm. (calculated as S).

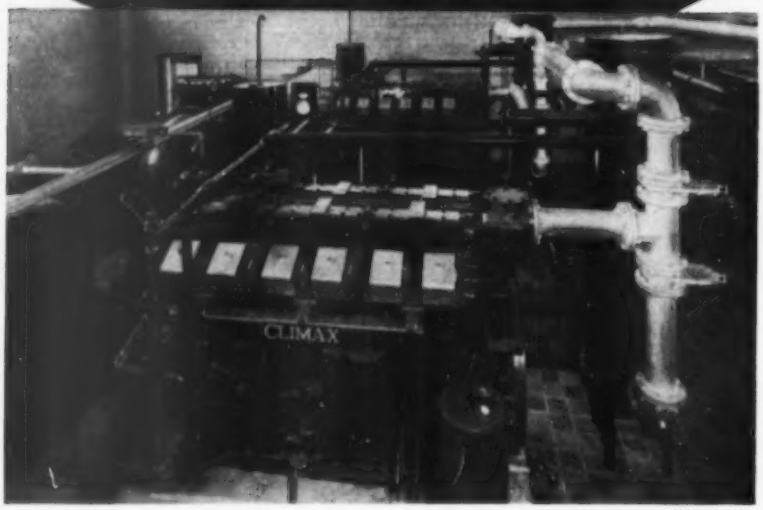
* * *

Tom Hay reports 5.26 cu. ft. of sewage gas per pound of volatile solids added for Racine, Wis.

* * *

Ed Ross, Richmond, Ind., reports 9.32 cu. ft. of sewage gas per pound of volatile solids added. Some of the solids were garbage.

climax BLUE STREAK ENGINES
provide power in the new CANTON, OHIO
SEWAGE TREATMENT PLANT



The City of Canton, Ohio recently placed in operation its new activated sewage treatment plant designed by and built under the supervision of Alvord, Burdick & Howson, Engineers. This new plant has a design capacity of 20 MGD or a maximum of 30 MGD.

In addition to handling the sewage, the City's garbage is ground at the plant and is digested with the sewage which materially increases gas production. Each of the three 18 MGD Worthington sewage pumps is powered by a Climax Blue Streak 200 H.P., 700 RPM sewage gas engine. By means of automatic float controls engine speeds are varied to provide each pump with a discharge capacity of from 9 to 25 MGD against a head of 35 ft. Heat of the jacket water and exhaust gases is recovered and utilized for the digesters and buildings.

climax ENGINE AND PUMP MFG. CO.

Factory and General Office: Clinton, Iowa
Regional Offices: Chicago, Ill., Dallas, Texas

NEW WATER & SEWAGE BOOKS

Water. By Thomas King. (Macmillan Co., New York. $3.50.)

The author of this book, director of the Maryland Academy of Science, evidently knows and loves his subject. He has distilled the information provided by hundreds of sources; he has collected pertinent data in fields ranging from chemistry and atomic physics to hydraulic engineering, irrigation, soil erosion, and oceanography.

Many curious facts have been recorded by Mr. King—in an authoritative and readable fashion. Did you know, for example, that the seas contain enough salt to cover "the whole earth to the depth of 112 feet" . . . that nine-tenths of all animal and vegetable life are in the sea . . . that water in the ocean depths at the equator usually registers a temperature of about 32°F . . . that an acre of alfalfa on a warm bright summer day uses six tons of water an hour . . . or that the Roman aqueducts carried 130 million gallons per day, of which 92 million were used in the city itself?

Mr. King emphasizes that, to continue living on this planet, we must learn to conserve and harvest water as never before in our wasteful history. In the final pages of his book, he points to some startling warnings: population growth is rapid, land is being destroyed through erosion, and the water table is being lowered—the rates are such that *unless they are changed* we will be desperate for food and water in a matter of decades.

Frazza Promoted by Johns-Manville

Johns-Manville Sales Corporation, New York, N.Y., has announced the promotion of Louis F. Frazza to the position of Staff Manager of the Transite Pipe Department.

In his new position, Mr. Frazza will be responsible for the marketing of Transite pressure, sewer and irrigation pipe throughout the country.

All-Purpose Rotary Shaft Seal Provides Long Service Life

301

Crane Packing Co., Chicago, Ill., has developed a new all-purpose mechanical seal, completely proven in design and construction. Known as the "John Crane" Type 19, the seal is said to provide life-time performance in small pumps, hot water circulators, and many other rotary shaft applications.

Special beveled cones made of Teflon (DuPont Trademark for tetrafluoroethylene resin) are utilized as the flexible member. This adapts the seal for services involving water, oil, corrosives or acids; temperatures from −100° to +450°F.; vacuums and pressures to 200 psi; and high shaft speeds.

Being a packaged type unit, the "John Crane" Type 19 Seal provides quick and easy installation for production assembly and replacement service. It is presently available in sizes to fit shaft diameters of ¼, ⅜, ½, ⅝ and ¾ inches. The metallurgy of the seal, bronze, stainless steel, etc., can be specified to meet service requirements or operating conditions.

STEVENS

TYPE B-FT RECORDER PROVIDES PERMANENT DATA ON SEWAGE FLOW

At this modern sewage treatment plant in Dallas, Oregon, the STEVENS Type B-FT Recorder provides a permanent graphic record of flow in million gallons per day (range 0-6 MGD) and totalizes the volume in gallons. The STEVENS Recorder is mounted over a stilling well connected to a 9" throat width Parshall flume.

record flow accurately . . . automatically

There is good reason why modern municipal sewage and industrial waste measuring installations use the STEVENS Type B Recorder. It may be wall, pedestal or panel mounted, is easily operated and will give a lifetime of accurate, trouble-free service. This Recorder uses a circular chart which makes one revolution per day or per seven days, as specified, while the pen swings in an arc around an external center—the combined movements thereby producing a graph of the rate of flow (or head) against time. Volume is indicated on a counter-type totalizer. Accuracy of the registration is limited only by the accuracy of the rating to which the totalizer is set. Flow or head (or both) may be indicated on a scale clearly visible through a large glass port.

RECORDS FLOW
RECORDS HEAD
TOTALIZES FLOW
Direct Float Operated or Remotely Controlled

To find out more about the STEVENS Type B Recorder, and how it can simplify the task of compiling accurate flow records, write for FREE Bulletin 25.

SEND FOR NEW STEVENS DATA BOOK

Puts interpretive data at your finger tips. 144 pages of technical data . . . information on float wells and recorder installations . . . a wealth of hydraulic tables and conversion tables.

$1.00

Foremost in Precision Hydraulic Instruments Since 1907

LEUPOLD & STEVENS INSTRUMENTS, INC.

4445 N. E. GLISAN STREET • PORTLAND 13, OREGON

Clow Elects Chairman of Board and President

W. E. Clow, Jr. Becomes Chairman; John Madden Made President.

James B. Clow & Sons, Chicago, Ill., has announced that the Board of Directors of the company has elected William E. Clow, Jr. as Chairman of its Board and John Madden as President of the Company.

Mr. Clow, who was President during the years 1935 to 1941, will fill the office left vacant since the death of his father in 1942. He has been with the Company since 1907 and a Director since 1910.

Mr. Madden succeeds Kent S. Clow, prominent industrialist and brother of William E. Clow, Jr., who died December 14th last. Mr. Madden started with the Company as a salesman in 1921, was elected a Vice-President in 1946 and a Director in January, 1951.

The Board also announced the appointment of G. R. Kinnally as General Manager of the Jobbing Division, and he will take over the duties vacated by the new President. Mr. Kinnally started as a salesman with the Company in 1928.

SLUDGE DISPOSAL ~~EXPENSE~~ *Income*

It's easy to convert a cost into a sizeable income with a ROYER

A Royer Sludge Disintegrator takes sludge cake right from the drying beds and processes it into a readily saleable fertilizer. Sludge with a moisture content as high as 56% is shovelled into the low hopper, additional ingredients added if desired, and a completely shredded, pulverized and aerated product is discharged —free of all sticks, stones and trash.

Instead of the expensive operation of burning, burying or hauling sludge you have an easily earned source of income. The nitrogen-rich fertilizer prepared with a Royer is in ever-increasing demand by florists, nurserymen, gardners, parks and golf courses.

All over the country sewage disposal plants are using Royers to turn the bothersome, expensive job of sludge disposal into a source of revenue. It will pay you to investigate the possibilities in your plant. Send for a copy of our "Sewage Sludge Datalog" giving all the facts.

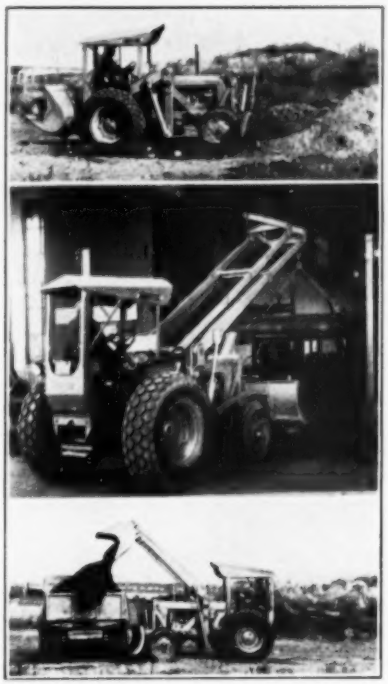
Illustrated above is a Royal SJR-G in the sewage treatment plant at Birmingham, Mich.

ROYER

PIONEERS IN THE SALVAGE OF SEWAGE SLUDGE

ROYER FOUNDRY & MACHINE CO.

170 SPRINGLE ST., KINGSTON, PA.



Versatile Multi-use Combination Unit

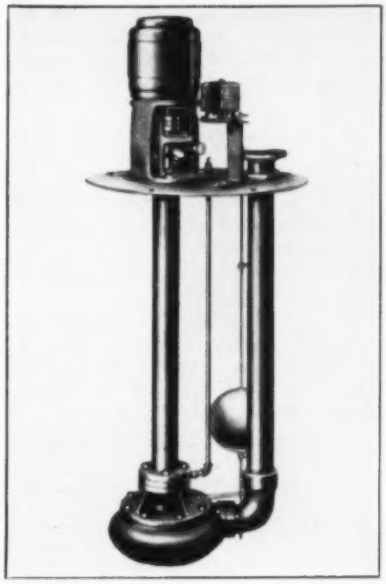
Serves as Loader-Dozer-Crane.

302

A new cost-cutting combination for loading and dozing has recently been announced by the Industrial Division of Oliver Corporation, Chicago, Ill. An Oliver Wheel Tractor with "Strait-line" Loader is a unit that digs at either end, swings its load overhead, and loads in front. According to the manufacturer, the rear-carried bucket load multiplies traction and makes steering easier. The straight-line operation saves valuable time in loading operations.

With the front mounted bulldozer-angledozer blade ready for service, all that is necessary is to push a lever and the tractor is ready for dozing, Carrying a loaded bucket on the rear (see top view) gives added traction and makes wheel tractor dozing very effective.

As an added feature, the loader bucket may be removed from the "Strait-line" unit and replaced with a crane (see center view) which can operate at either end of the tractor. This unit is then ideal for handling large meters, valves, hydrants, pipe, poles, heavy machinery, etc. The crane's ability to function at the rear as well as at the front is important where soft footing is encountered. It makes steering easier and allows use of the unit under conditions where a load in front would make operation impossible.



Vertical Sewage Pumps

303

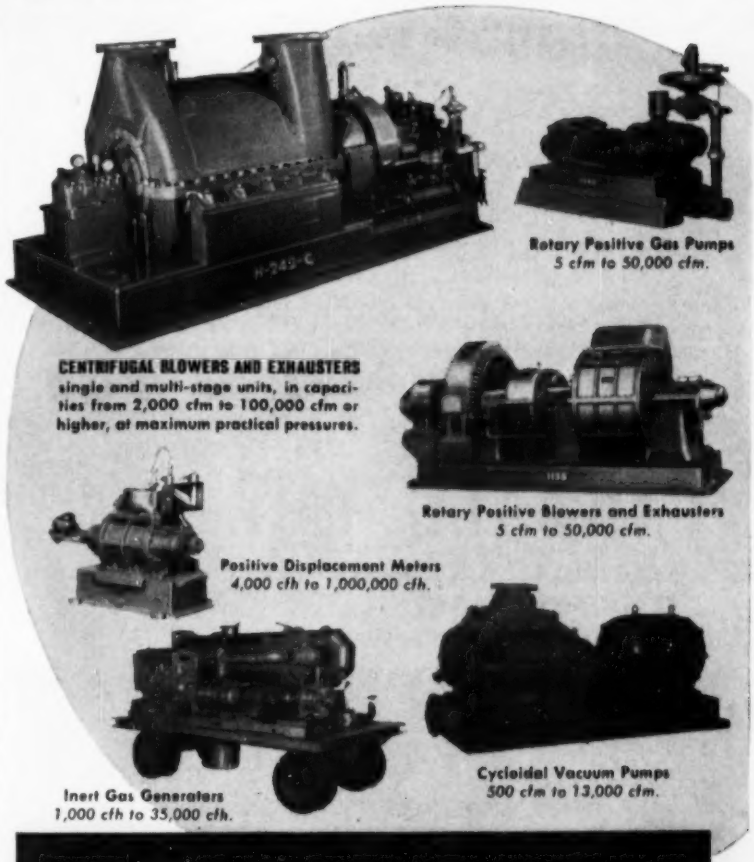
The Deming Company, Salem, Ohio, has announced a new line of vertical sewage pumps that have fluid ends in 2", 3" and 4" sizes designed to handle solids 1½", 2" and 3" in diameter, respectively. Capacities range from 50 to 1000 gallons per minute against heads up to 60 feet.

Units can be furnished with electric motors up to 20 H.P. or equipped for steam turbine drive. Motor mounting is designed with standard NEMA type "C" flange or, at extra cost, an adapter flange can be furnished for other types of motor mounting brackets.

Among the noteworthy features of these pumps is the thrust bearing assembly. The coupling in the lower half of the unit fits accurately into the bore of a large capacity, angular, contact radial and thrust ball bearing.

This thrust bearing assembly is mounted on the end of the pump shaft directly under the adjusting nut. The ball bearing is grease lubricated and sealed against outside dirt.

Impeller is an enclosed, 2-vane, non-clog type, adjustable vertically with shaft. Impeller is mounted on shaft with locking taper, woodruff key and safety lock nut. Wearing rings snub any shock on the impeller and prolong life of pump.


Rotary Positive Gas Pumps
5 cfm to 50,000 cfm.
CENTRIFUGAL BLOWERS AND EXHAUSTERS
single and multi-stage units, in capacities from 2,000 cfm to 100,000 cfm or higher, at maximum practical pressures.
Rotary Positive Blowers and Exhausters
5 cfm to 50,000 cfm.
Positive Displacement Meters
4,000 cfh to 1,000,000 cfh.
Inert Gas Generators
1,000 cfh to 35,000 cfh.
Cycloidal Vacuum Pumps
500 cfm to 13,000 cfm.

WE *Specialize* IN YOUR PROBLEMS OF MOVING GAS OR AIR!

You may need to move a thimbleful of gas . . . or create a cyclone of whirling air. Whatever your problem, we've probably met something close to it, in experience of almost a century of building such equipment.

Another reason why we know so much about this job is that it's all we do. Our customers range from the "giants of industry" to the neighborhood plant, both of whose production depends upon continuous, reliable, economical performance of air and gas handling units. Because we build the exclusive *dual-ability* line of Rotary Positive and Centrifugal Units, in a wide range of sizes, we offer a *dual choice* which permits completely unbiased recommendations.

So—if you have a problem today—or anticipate one a year or five years from now, we suggest you call upon the facilities of R-C Specialists. Write for bulletins on any specific equipment.

ROOTS-CONNERSVILLE

Exclusive Specialists in Handling Gas and Air

BLOWER BUILDERS SINCE 1854

ROOTS-CONNERSVILLE BLOWER

A DIVISION OF DRESSER INDUSTRIES, INC • 353 Mount Ave. • Connersville, Indiana

Neptune Meter Co. Retires Six Veteran Stalwarts

A.W.W.A. Honors and Awards have been earned by Four

The Neptune Meter Company has announced the retirement of six men, the first to retire under a plan conceived eleven years ago and becoming effective this year. Five have been members of the sales staff and one a factory representative—all well known in the water works field:

Charles B. Bachmann, New York
James R. Barker, San Francisco
Rollo K. Blanchard, New York*
Francis Cunningham, Chicago
Edward W. Thompson, Portland
J. Rex Van Gorder, New York

Mr. Blanchard, who received the Fuller Award of the New York Section of the A.W.W.A. in 1943, joined Neptune in 1910. He became Vice-President and Director in 1924. He intends to continue as Secretary-Treasurer of the New York Section and also as Secretary of the Fuller Award Society. He will continue as a Director of Neptune Meter Co.

Mr. Barker received the Fuller Award of the California Section in 1950. He joined the company in 1898 and became a Vice-President in 1939. Jim Barker was one of the prime movers in the Calif. Section of AWWA, for many years handling annual meeting exhibits and entertainment for the W. & S. W. Mfrs. Assn.

Mr. Thompson received the Powell-Lindsay Citation of the North West Section in 1951. He started with the company in 1907 and was made District Manager of the Portland office when it was established in 1912, and has been in charge since that date.

Mr. Cunningham was recipient of a Special Citation from the Wisconsin Section in lieu of the Fuller Award, in 1952. He began his service with the company in 1904.

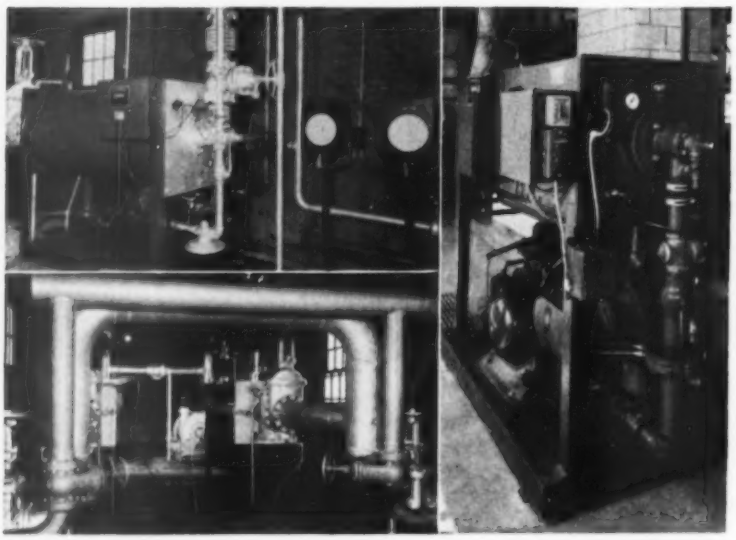
Mr. Van Gorder came to Neptune in 1919; was elected Vice-President in 1936, Director in 1938 and, along with being General Sales Manager, held these positions at the time of his retirement.

*Rollo Blanchard was signally honored in January by the AWWA Board of Directors. Having received word of the pending retirement Mr. Blanchard, as a former member of the Board and long-time Secretary of the N.Y. State Section, the AWWA Board presented to Rollo Blanchard an illuminated scroll signed by members of the Board and the association's General Policy Committee.

CARBALL UNIT...

SPECIFICALLY DESIGNED FOR THE CLEAN, EFFICIENT CARBONIZATION OF LIQUIDS

92% TOTAL CHEMICAL EFFICIENCY



- A CO_2 producer that *COMPLETELY* burns GAS or OIL.
- Produces the highest percentage of CO_2 gas with no CO or condensible carbon.
- Completely eliminates oil scum . . . no taste imparted to potable waters.
- No scrubbers or filters required.
- Compressor handles clean, cold air only. The fuel is burned under sufficient pressure to cause deep diffusion directly from the producer.
- Diffuses CO_2 gas by efficient impingement diffuser, insuring 92% absorption and eliminating diffuser corrosion.
- A factory-tested, package unit with air compressor, fuel pumps and appurterances.
- 50% more chemical efficiency than any other method in current practice.

To Reduce Costs and Modernize Your Plant:

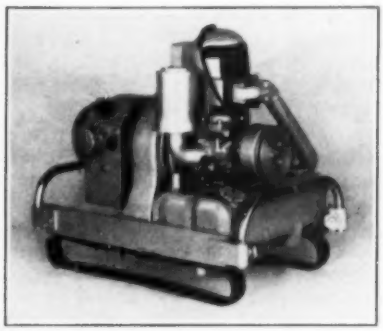
WRITE FOR BULLETIN 7W64

WALKER PROCESS EQUIPMENT INC.

PROQUIP PROCESS EQUIPMENT

FACTORY • ENGINEERING OFFICES • LABORATORY

AURORA • ILLINOIS



New Portable Generator

304

Homelite Corporation, Port Chester, New York has announced a new Dual-Voltage 5 Kilowatt carryable generator, designed to meet modern industry's growing needs.

The new generator, Model 32A115/230-1, will carry a continuous load of 5,000 watts, single-phase, 60 cycle alternating current at either 115 or 230 volts. It is a carryable generator with enough power to start and operate a great variety of electric tools and equipment such as electric saw, grinders, drills, routers, tampers, in the construction and transportation fields, and for emergency lighting and standby power for municipalities, communication companies, farms, homes, etc.

A 115 volt AC standard convenience outlet is supplied, together with a special waterproof 3-pole receptacle

for connecting either 115 or 230 volt motors, tools and appliances. Driven by a Homelite Model 32 gasoline engine, the generator has specially impregnated armature and coils to give high resistance to oil, moisture, and abrasive rust. For maximum compactness, the armature is keyed directly to the one-piece, drop-forged, engine crankshaft; and the large size carbon brushes are easily accessible. Voltage regulation from no load to full load is approximately 4%.

Brown Named Sales Manager of U. S. Pipe

United States Pipe & Foundry Co., Burlington, N.J., has announced the appointment of Carl N. Brown as Sales Manager for Cast Iron Pipe.

Mr. Brown has been connected with the sales department since shortly after his graduation from Brown University in 1925. He was a salesman in the Philadelphia office, sales agent at Kansas City and Boston, assistant western sales manager and western sales manager at Chicago, and has been assistant general sales manager at Burlington since July 1950.

He is president of the Water and Sewage Works Manufacturers' Association. He was secretary of the Illinois Section of American Water Works Association for four years just prior to moving to Burlington.

Algaedyn—Kills and Controls Growth of Algae, Scum and Slime in Swimming Pools

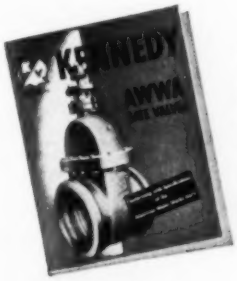
305

United States Movidyn Corporation, Chicago, Ill. has announced Algaedyn, a new product which kills and controls the growth of algae, scum and slime in swimming pools, and all types of water systems.

The new chemical compound has as its principal ingredient Movidyn, the colloidal silver compound which has outstanding bactericidal properties and has been found in tests by the United States Army and U. S. Public Health Service to kill the common

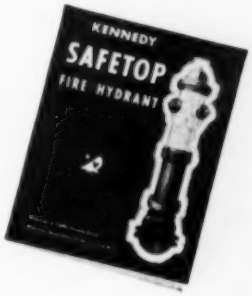
Ask for this complete reference library on KENNEDY valves and hydrants

It's specially designed to make your specifying job easier. These three handy, easy-to-use booklets describe the complete KENNEDY line of A.W.W.A. valves and fire hydrants.



To help you specify A.W.W.A. valves, KENNEDY Bulletin 106 gives detailed specifications . . . lists the wide range of types, sizes, controls accessories, connections, and gearing arrangements available. It's packed with facts you'll want for reference material in your permanent file.

See how one man can repair a KENNEDY SAFETOP hydrant in only 11 minutes. KENNEDY Bulletin 105 tells the complete story . . . how the easily replaceable threaded breaking ring breaks cleanly under an unusually heavy blow . . . and how one man, with only a few common tools, can put it back on the job in a very few minutes.



When you want low-cost dependability in hydrants . . . KENNEDY Bulletin 109 describes all the dependable, money-saving features of KENNEDY STANDARD hydrants. It also gives full details on the various accessories and nozzle arrangements available with these hydrants.

The complete set of 3 booklets is yours for the asking. Write today for Bulletins 105, 106, and 109.

Est. 1877

THE KENNEDY VALVE MFG. CO. • ELMIRA, N.Y.

VALVES • PIPE FITTINGS • FIRE HYDRANTS

types of bacteria in hitherto unknown small dilutions. One part of Movidyn in ten million parts of water has been shown to destroy effectively the major kinds of germs in exposures of only a few hours.

The new algaecide is now on the market and ready for swimming pool owners to use this summer to control algae and other obnoxious plant growth in their pools which until now have required frequent changes of the entire water contents of a pool. Another property of Movidyn which makes Algaedyn unique in its effectiveness is its continuing residual action which causes the walls and bottoms of pools to become themselves algaecidal in action. According to Dr. Zdenek V. Moudry, vice-president of United States Movidyn, pools treated with Algaedyn will retain their algae killing properties for long periods even though no new Algaedyn is added.

The new algae killer, is used for best results in proportions of one gallon of Algaedyn to 50,000 gallons of water, the contents of an average-sized private swimming pool. In these proportions small additional treatments of Algaedyn, totalling about three gallons for a season will keep all algae growth stopped.

C. S. Northen
V.P. Sales

R. E. Garrett
V.P. & Comptroller

Executive Elections At U. S. Pipe

United States Pipe & Foundry Co., Burlington, N.J., has announced that Charles S. Northen has been elected vice president in charge of sales and Robert E. Garrett has been elected vice president and comptroller. Mr. Northen assumes the office held by D. B. Stokes who is retiring after having been with U.S. Pipe for 42 years.

Mr. Northen is a native of Atlanta, Georgia, and an engineering graduate of Georgia Tech. In 1929, he became vice president in charge of sales for Avondale Mills. Leaving that company in 1945, he became vice president of sales of Sloss-Sheffield Steel & Iron Company. Mr. Northen is a director of several companies and is active in civic affairs, being a director of the Birmingham Chamber of Commerce and serves on the executive board of the Boy Scouts.

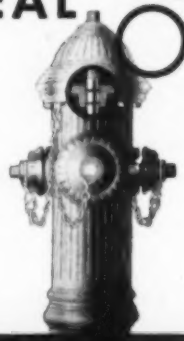
Mr. Garrett is a native Alabamian and attended school in Birmingham and at the University of Alabama. He has worked for Sloss-Sheffield Steel & Iron Company since 1929, his first job being as errand boy.

"O" RING SEAL REPLACING CONVENTIONAL PACKING
1. BRONZE SLEEVED STEM 2. O RING DIRT SEAL 3. O RING PRESSURE SEAL 4. O RING SEAL PLATE
1
2
3
4

SMITH HYDRANTS
WITH "O" RING SEAL

"O" Rings replace conventional packing and reduce maintenance to a minimum. The lower "O" Ring is the pressure seal, the upper "O" Ring the dirt seal. The specially compounded rubber plastic "O" Rings do not deteriorate and insure a long life pressure seal.

All Smith Hydrants including Hydrants in service can be fitted with "O" Ring Seal Plates. Write for details.



THE A.P. SMITH MFG. CO.
EAST ORANGE, NEW JERSEY

Self-Scouring Elliptical Venturi Tube

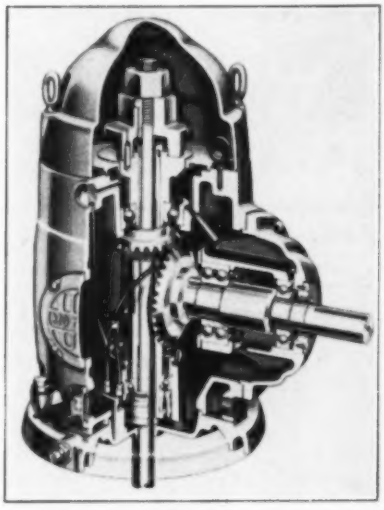
306

Simplex Valve and Meter Company, Philadelphia, Pa., has developed a venturi tube with an elliptical throat to solve the problem of accurate

measurement of low-velocity sewage, sludge, or trade wastes, even under low-pressure conditions.

The major dimension of the throat's ellipse is in the vertical plant, and equal to the diameter of the circular main section. This permits a horizontal invert, and a flat straight bottom that is self-scouring of sediments or solids.

The circular inlet and outlet readily fit existing mains, and the straight, flat top of the venturi tube prevents the accumulation of air or gas.



New Right Angle Gear Drive For Vertical Turbine Pumps

307

U.S. Electrical Motors, Los Angeles, Calif. has developed a new right angle gear drive for operating deep well pumps in locations where electricity is not available or where gas can be economically used for power. It permits the use of gas, diesel or gasoline engine power. It is being placed in full production to 70 h.p. and larger sizes are to be added.

This new drive is universally adaptable to any vertical pump and should find wide favor in irrigation, water production for remote oil wells, public utilities, mining operations and for construction operations where water is to be lifted from a source distant from power lines.

This drive, called the U.S. Holloshaft, introduces several novel features. It provides constant cycling of oil which can be visually observed by incorporation of a "Lubripeek" window and a flush-style "Visolube" oil gauge. The operator can view the flow of oil from the exterior. The thrust bearing set in the top is easily accessible and can be removed without disturbing the hollow shaft or gears. A reverse protection clutch

for valving corrosive and "hard-to-handle" fluids . . .

HILLS-McCANNA

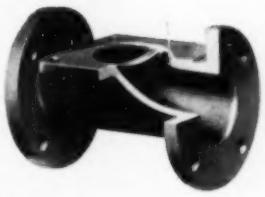
offers over 20,000 different "custom-made" assemblies on a standardized basis

32 standard operators

Methods of operation for Hills-McCanna Valves include handwheel and lever operators, sliding stem, air and hydraulic cylinders, diaphragm motors and electric motors in a variety of types.

14 standard diaphragms

Diaphragms, the heart of Hills-McCanna Valves, are offered in the widest choice to best suit your individual needs; 5 types of rubber, 3 of Neoprene plus Hycar, butyl, Tygon, Compar, special polyethylene and Kel-F.



48 standard body materials

Bodies for Hills-McCanna valves are furnished in cast iron, with or without such linings as rubber, glass, lead, etc.; in any machinable alloy or in such materials as Karbate, stoneware, porcelain, etc.

By offering such a broad selection of operators, diaphragms and bodies, Hills-McCanna is able to furnish so many standard combinations that the user is in the position of being able, in most cases, to find the exact valve that best fits his individual requirements. There is virtually never any need to adapt to your service a valve developed for someone else's needs.

The 36 page catalog No. V-52 gives full details on all Hills-McCanna Valves. Write for your copy. HILLS-McCANNA CO., 2357 W. Nelson St., Chicago 18, Illinois.

HILLS-McCANNA

saunders patent diaphragm valves

Also Manufacturers of Proportioning Pumps Force Feed Lubricators • Magnesium Alloy Castings

prevents the pump shaft from becoming unscrewed in case of torque reversal.

Col. Rockwell Joins Mutual Security Program

Colonel Willard F. Rockwell, Pittsburgh Industrialist and Chairman of the Board of Rockwell Manufacturing Company, Standard Steel Spring Company, Timken-Detroit Axle Company, has been named a key aide in reorganization of the Mutual Security Program.

In a recent meeting in New York with President Eisenhower and Governor Stassen, Colonel Rockwell was advised that he had been drafted for service with the Mutual Security Agency. It has been announced through the press that there will be considerable revision and consolidation with such other agencies as the Economic Cooperation Administration, but there is no definite information available to permit conclusions as to the recommendations of the new administration or of the changes which may be expected after due consideration by Congress.

Colonel Rockwell's companies have many affiliations and contracts with British and Western European industries, and he has made frequent trips abroad on international business. As a result of his domestic and foreign experience in industry and his familiarity with the problems of international trade, he has been drafted into the Eisenhower administration as an expert consultant on productivity.

M. J. Harper
Vice President

H. Gottwald
Eastern Manager

Executive Appointments At Rockwell

Rockwell Manufacturing Co., Pittsburgh, Pa., has announced the appointment of M. J. Harper as Vice President and H. Gottwald as Eastern Regional Manager of Sales and District Manager of New York District Office.

Mr. Harper has been in the Meter and Valve Division of the Company for over 30 years as District Manager of the New York office, and until his new appointment, he was Regional Manager of the Eastern Region, coordinating the activities of the Boston, New York and Philadelphia offices.

Mr. Harper, in his new capacity, will be working on special assignments and will headquarter in New York City.

Fair Weather or Foul . . . No Water Can Enter Head to Freeze, No Sediment Can Reach Operating Thread

MATHEWS
HYDRANTS

Made by R. D. Wood Company

Public Ledger Building, Independence Square
Philadelphia 5, Pa.

Manufacturers of "Sand-Spun" Pipe (centrifugally cast in sand molds) and R. D. Wood Gate Valves

● The stuffing box plate, cast integral with the nozzle section, covers the entire area of the head and, with the packing, prevents water from reaching the operating thread. This means no rust can form and no sediment can be deposited on the thread to wear and destroy it.

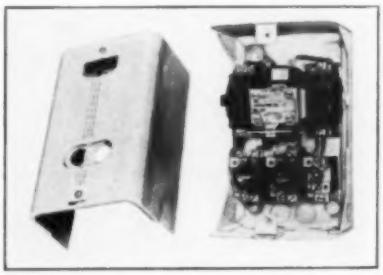
● No matter how cold the weather, the stem thread cannot freeze to the nut, nor can ice form inside it to interfere with closing the hydrant.

● Community fire protection is assured with the installation of Mathews Hydrants—vital links between hose and water main.

No Other Hydrant Offers So Many Essential Features

Compression type valve prevents flooding • Head turns 360° • Replaceable head • Nozzle sections easily changed • Nozzle sections easily raised or lowered without excavating • Protection case of "Sand-Spun" cast iron for strength, toughness, elasticity • Operating thread only part to be lubricated • All working parts contained in removable barrel • A modern barrel makes an old Mathews good as new • Available with mechanical-joint pipe connections

150th anniversary



Magnetic Starters, Contactors, and Relays

308

Cutler-Hammer, Inc., Milwaukee, Wis. has announced a new line of magnetic starters, contactors and relays.

This new line incorporates a simple 5 unit construction designed to install easier, work better, last longer. A wrap-around cover pulls off, fully ex-

posing the front and both sides of the unit for 180 degree accessibility. The 5 independent parts consists of 2 contact blocks, a magnet coil, an armature and a 3-coil or 2-coil overload relay mounted on a steel panel. Each part can be removed from the front without disturbing another part.

The new line features a 3-coil, adjustable overload relay permitting 4 ratings from each heater coil by changing its position. This adjustability provides protection within 3% of full load motor rating. The 3-coil overload offers better protection against single phasing where unbalanced or unstable line conditions may occur.

Bucket Elevator Affords Wider Use in Less Space

309

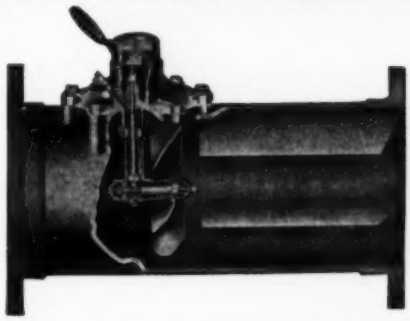
The Omega Machine Company of Providence, R.I. has designed a small, compact bucket elevator for loading feeder storage hoppers in limited areas.

The new elevator, model BES-77, houses its malleable iron buckets in a 9" x 24" steel casing which is considerably smaller than the average size elevator currently on the market. These compact dimensions permits its use in chemical feeder rooms where minimum floor space is an important factor.

The boot, head and center section is fabricated of 12 gauge mild steel and can be constructed to an overall height of 25 feet, if necessary. Each section has flanged ends and dust-tight joints.

Driven from a 1½ H.P. gearhead motor, the feed buckets travel on pintle chain from boot to head at a maximum delivery of 200 cubic feet per hour. Dust collectors, bin level

SPARLING MAIN-LINE METERS



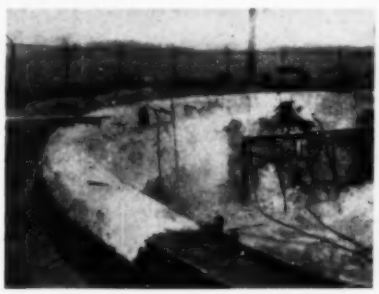
SIMPLE IN ACTION - - - - ACCURATE
EASY TO INSTALL

YOU are in good company when you install Sparling Main-Line Meters! Over 20,000 of these simple propeller-type meters keep accurate account of flows in municipal, railroad and industrial water mains.

Quotations and Bulletin 312 come at your request

SPARLING METER COMPANY
INCORPORATED

LOS ANGELES 54	Box 3277	626 Broadway	CINCINNATI 2
CHICAGO 8	1500 South Western Avenue	6 Beacon Street	BOSTON 8
SEATTLE 1	1932 First Avenue	726 Reserve Loan Life Bldg.	DALLAS 1
NEW YORK 17	101 Park Avenue	66 Luckie St., N.W.	ATLANTA 3
	KANSAS CITY 6	6 East 11th St.	



DISINTEGRATED RESERVOIR RESTORED BY CEMENT GUN CO. WITH "GUNITE"

Climatic conditions had ruined the surface of this water storage reservoir at a Central Pennsylvania Institution. Cement Gun Company was called in to restore the structure with "Gunite." Photograph at left, above, shows our crew removing all of the disintegrated concrete prior to covering the wall with wire mesh. With reinforcing in place, "Gunite" was applied to bring the walls up to their original thickness (see photo above, right).

Complete information on many water storage reservoirs constructed or restored by Cement Gun Company are illustrated and described in our latest catalog, together with many other types of "Gunite" work we have done. A request, on your letterhead for catalog C 2400 will bring your copy by return mail.

CEMENT GUN COMPANY
"GUNITE" CONTRACTORS
GENERAL OFFICES—ALLENTOWN, PENNA. U.S.A.
MANUFACTURERS OF THE CEMENT GUN

● If interested in equipment or literature mentioned below, mail a Reader Service Card with your name, address, and item key number.

switches and other accessories are available with this equipment when required.

Welsbach Now Manufacturing A. P. Smith Corporation Tapping Machines and Parts

The A. P. Smith Manufacturing Company, East Orange, N.J., has announced that they have discontinued the manufacture of bronze water service line fittings (sizes ½" through 2") and Corporation Tapping Machines used to insert Corporation Stops under pressure.

Smith designs, patterns and production equipment for the above products have been purchased by The Welsbach Corporation of Philadelphia.

The Welsbach Corporation will be manufacturing Smith design Corporation Tapping Machines and parts through its Kitson Valve Division at 1500 Walnut Street, Philadelphia 2, Pennsylvania. There will be no interruption in the continuing supply of machines and parts.

A. P. Smith will concentrate production facilities on the manufacture of cast iron water, gas and oil service products; namely, gate valves, fire hydrants, tapping sleeves and valves, inserting valves, tapping-drilling machines, valve inserting machines and related special items.

"Jack" Orr Dies

Popular Southern Rensselaer Representative

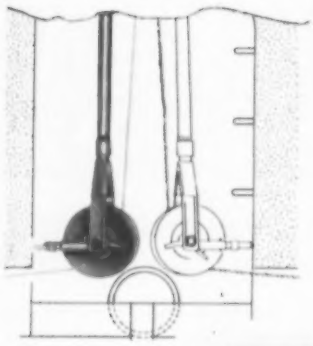
J. P. Orr, representative of Rensselaer Valve Company, died on December 13, 1952, at the age of 50.

Mr. Orr had been with Rensselaer since shortly after his graduation from the Engineering School of Purdue University in 1924. For a time, he worked under the late Matthew H. Collins out of the Louisville office.

Prior to service in 1937, in the Corps of Engineers during World War II, he was located in Dallas, Texas, as Southwest Sales Manager. After the war he was appointed Southern Branch Manager with offices in Memphis, Tennessee. He occupied this position until his death.

Now!
BUCKET MACHINE SEWER CLEANING
Made Easy!

Set-Up Time CUT 80% by FLEXIBLE'S New Surface-Hung MANHOLE ROLLER



No Climbing Down Manholes!

Now, instead of merely hand-rodding a temporary opening in the stoppage (for so-called economy's sake)—FLEXIBLE has the answer. In a fraction of the time of installing ordinary jacks, this new smooth-operating MANHOLE ROLLER installs from the surface... fits any manhole (even over-flowing)...works loose brick manholes...and enables you to do a *thorough* BUCKET MACHINE job faster, easier, economically.

PAT. APPLIED FOR

WRITE today

Flexible

SEWER-ROD EQUIPMENT CO.

9059 VENICE BOULEVARD, LOS ANGELES 34, CALIF.

41 Greenway St. — Hamden 14, Conn. | 66 Kinjry Drive — Rochester 9, New York
147 Hillside Terrace — Irvington, N. J. | 29 Cordan Avenue — Roslindale 31, Mass.
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1115 Delaware Ave. — Fort Pierce, Fla. | 3786 Durango St. — Los Angeles 34, Calif.
141 W. Jackson Blvd. — Chicago, Ill. | 4455 S.E. 24th Street — Portland, Oregon
200 Magee Bldg. — Pittsburgh, Penn. | 351 West Jefferson Blvd. — Dallas, Texas
Francis Hankin — Montreal & Toronto, Canada

AMERICA'S LARGEST MANUFACTURER OF PIPE CLEANING TOOLS AND EQUIPMENT

Plastic Housing and Cover for Water Meters

310

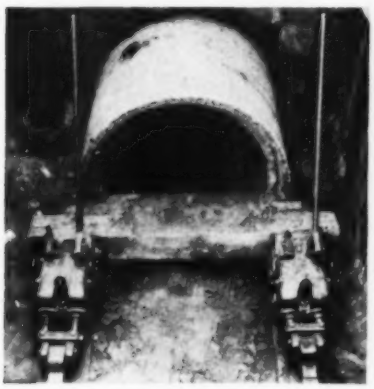
Worthington-Gamon Meter Division of the Worthington Corporation, Newark, N.J. is field testing

SAVE HOURS,

CUT COSTS ON YOUR

PIPING JOBS

PUSH PIPE UNDER STREETS, TRACKS, walks, floors and other obstacles with a GREENLEE Hydraulic Pipe Pusher. One-man-operated, portable, simple to operate. No tearing up of pavement . . . eliminates extensive ditching, tunneling, back-filling, tamping, repaving. Cuts job time to a fraction. GREENLEE Hydraulic Pipe Pusher often pays for itself on first job. Two sizes—model shown above for pushing ¾ to 4" pipe. Larger unit, below, for pipe over 4", concrete sewer pipe and large drainage ducts. Power pump also available for extra ease and speed of operation.



GREENLEE

Write today for descriptive literature. Greenlee Tool Co., 2243 Columbia Avenue, Rockford, Illinois, U.S.A.

Kralastic, a tough, corrosion-resistant, rubber-based plastic, as a substitute for bronze in water meter register boxes and covers.

The company is testing 5,000 meters equipped with these Kralastic parts. The tests are being made in every section of the United States.

Kralastic is a product of the Naugatuck Chemical Division, United States Rubber Company. This plastic is also being used to manufacture corrosion resistant pipe for water systems, handling corrosive chemicals, and for various plumbing specialties.

The new register box and cover was jointly developed by Worthington Gamon, Naugatuck Chemical and Shaw Insulator Company of Irvington, N.J., which is producing the plastic parts by injection molding. Extensive research was done on the project over a two-year period.

Clamshell Doubles as Hoe, Dragline and Hoist

311

The Thew Shovel Company, Lorain, Ohio, has proven the versatility of the Lorain Clamshell at a new sewage disposal plant for the city of North English, Iowa. The main tanks at the plant measure 125 ft. in diameter and have a depth of 20 feet.

The ¾ yd. Lorain Clamshell, with a 45-ft. boom, was used to backfill the excavation, as a hoe and dragline to dig hard clay, set 30 tons of steel and handle a concrete bucket.

A Sure Corrective

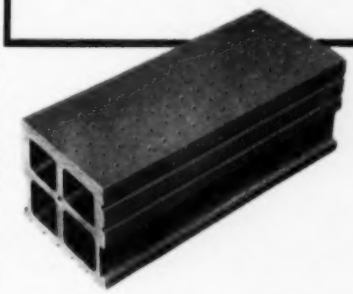
Your failures interest no one but yourself. Instead of whining, dig into your weaknesses and get rid of them. Recognition of weakness is a start toward its correction.

IT PAYS TO *Specify*

LEOPOLD

Glazed Tile

FILTER BOTTOMS



PERFORMANCE PROVED IN OVER 200 PLANTS WITH A DAILY CAPACITY OF MORE THAN 900 MILLION GALLONS!

With its many exclusive advantages, the Leopold Compound Duplex Filter Bottom provides the most practical and economical answer to your underdrain problems.

In this design, laterals and distributing blocks are combined in one permanent unit that insures uniform filtration over the entire filter bed and equal distribution of the wash water with minimum loss of head. The individual blocks—each about two square feet in area and weighing approximately 100 pounds—are made of highest quality de-aired fire clay, vitrified and salt glazed. They resist corrosion, are not subject to tuberculation, won't absorb any detrimental amount of water, and are impervious to acids and alkalis.

Adaptable to any rectangular filter unit, the efficient Leopold Filter Bottom needs only a shallow depth of small sized filter gravel to support the filtering medium. Further, the Leopold design does not require special supporting concrete members or the added concrete construction of a false bottom.

Complete Water Purification and Sewage Plant Equipment . . .

- **DRY CHEMICAL FEEDERS**
- **FILTER OPERATING TABLES**
- **MIXING EQUIPMENT**

Write today for details

F. B. Leopold Co., Inc.
2413 W. Carson Street
Pittsburgh 4, Pa.

Chain Belt Appoints New Sales Engineers

Chain Belt Company, Milwaukee, Wis., has announced the appointment of four new sales engineers to their district sales office organizations.

William C. Beals will become a member of Chain Belt Company's Buffalo District Sales Office. Mr. Beals studied engineering at Bucknell, Columbia and Wayne Universities and has had several years experience in industrial sales engineering.

Robert B. Hill has been assigned to the firm's Portland, Oregon, District Sales Office. He attended Gonzaga University where he studied electrical and mechanical engineering. Prior to joining Chain Belt, he worked in Northwestern United States in sales and supervisory capacities.

James W. Mueller will be working in Chain Belt Company's Chicago District Sales Office. Mr. Mueller had been an estimator and sales and production coordinator of the company's Chain and Transmission Division before this appointment.

Dabney P. Murrill has been assigned to the Chain Belt Atlanta District Sales Office. A graduate of Alabama Polytechnic Institute with a degree in Mechanical Engineering, Mr. Murrill was formerly a sales engineer of industrial equipment.

All four of the appointees have completed an intensive factory sales training course in the company's Milwaukee, Springfield, and Worcester plants.

SPRINGLOAD

A-C TENON TOOL

Machines Lathe-Smooth Tenons On-the-Job!

● ELIMINATES SHOP COSTS—HAULING COSTS—ADAPTERS

2 SIZES: 4" to 8"; 10" to 20" Handles *All* Pipe!

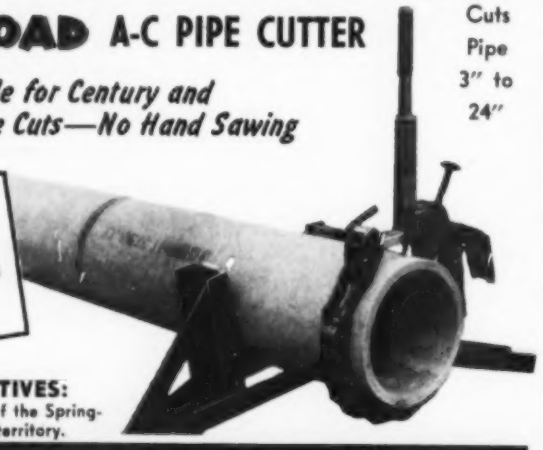
SPRINGLOAD A-C PIPE CUTTER

Cuts Pipe 3" to 24"

Fastest Cutter made for Century and Transite Pipe. True Cuts—No Hand Sawing

GRAVITY GRIP Thru

Lightweight—Portable! Holds any pipe for cutting on-the-job! 2 sizes: V-6: 2" to 6" V-16: 6" to 16"



SALES REPRESENTATIVES:
Write for complete details of the Springload franchise in your territory.

H. D. FOWLER CO., Inc. P. O. BOX 3084 SEATTLE 14, WASH.

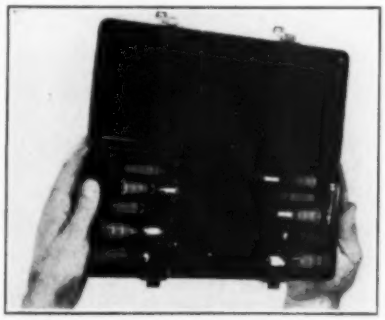
C. Yeomans
Chr. Board

D. W. Burgoon
President

Yeomans Elects New Chairman and President

Yeomans Brothers Co., Chicago, Ill., has announced that Charles Yeomans was recently elected chairman of the board. At the same time D. W. Burgoon, formerly vice president and general manager, was elected president.

Other Yeomans executive changes include the following: advancement of L. A. Ellner to the position of works manager and S. A. Norris to sales manager of the Pump division, both newly created positions.



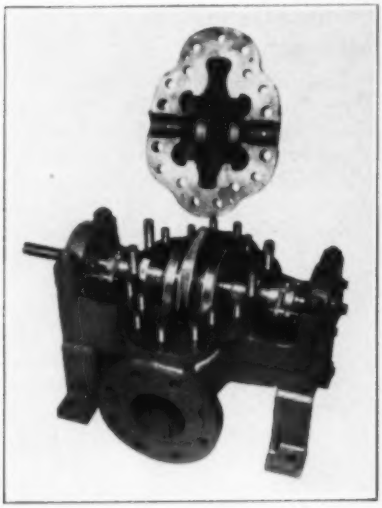
Predictable Performance Flow Test Kit

312

Fischer & Porter Company, Hatboro, Penna., has developed a new portable, wide-range flow test kit for laboratory research and field flow checking work. The kit consists of five PYREX brand glass TRI-FLAT metering tubes with five spherical

constant-density floats and Instruction Handbook all contained in a convenient carrying case.

The Handbook included with the kit contains a compilation of performance data for the new TRI-FLAT metering elements. Performance is predictable with high accuracy and the check calibrations formerly required for low flow rate work are now eliminated.



New Centrifugal Pump Series 313

Goulds Pumps, Inc., Seneca Falls, N.Y. has developed a new series of single stage, double suction centrifugal pumps, designated as the Fig. 3405 pumps, with several advances over previous designs.

Standard features on all the Fig. 3405 pumps include renewable stuffing box bushings, sealed bearing housings, cowl-type glands suitable for use with quenching liquids, stainless steel impeller keys, Teflon water seal rings, die-formed stuffing box packing, and corrosion-resistant gland bolts.

Compactness is an outstanding feature of the new pumps. Bearing spans have been kept to the shortest practical distance, resulting in overall savings in length of as much as 50% in some models.

The pump casings are horizontally split, and removal of the upper half permits inspection, maintenance, and removal of the entire rotating element without disturbing the suction and discharge piping, or pump and driver alignment.

In the figure 3405 line there are three different assemblies of shafts and rotating parts. However the wide interchangeability of parts in each

Which butterfly valve better meets your needs?

In either of these or any other valves, manual or automatic, which W. S. Rockwell builds for your exact needs, you're sure to get the right type and size to best meet the conditions of operating pressure, temperature and nature of fluid handled, whether it be air, gases, water, liquid or semi-solid chemical materials.

It will pay you to learn how Rockwell Valves can meet your plant's flow control requirements.

Rockwell stainless steel valve; with air cylinder operator and valve positioner; for throttling gases at 1200° F.

Rockwell heavy duty valve for 50 p.s.i. working pressure; has a replaceable rubber liner for valve body and stainless steel blade; with a motor operator and handwheel declutching unit.

ROCKWELL Valves

Write for Valve Catalog

W. S. ROCKWELL COMPANY

BUTTERFLY VALVES • SLIDE VALVES • AUTOMATIC VALVES

2763 ELIOT STREET • FAIRFIELD, CONN.

OVER 50 YEARS EXPERIENCE —Yet as modern as tomorrow...

BLACKBURN-SMITH PNEUMATIC SEWAGE EJECTORS

TO LIFT SEWAGE AND SLUDGE AT TREATMENT PLANTS

30 to 500 GPM in both single and twin units against high discharge heads.

Duplex Sewage Ejector, showing inlet piping.

Over 50 years service has proved the rugged worth of Blackburn-Smith Ejectors. Yet our today's product is full of exclusive modern features such as:

1. Float and electrical float switch controls.
2. Float and pneumatically controlled snap action valve.
3. Electrode controls.

Any one of the above, with or without Air Receivers.

Preferred by most prominent consulting engineers as less messy, more sanitary than centrifugal submerged type sewage ejectors or pumps. Ends screen and pump cleaning. Sewage can be lifted straight up—150 feet—any capacity—once a minute, without fail. Catalog S 50

REPRESENTATIVES WANTED. ADDRESS:

BLACKBURN-SMITH MFG. CO. 92 River St. HOBOKEN, N. J.

assembly makes it possible to provide 19 different pump sizes in the three groups. In addition, a unique locking design of shaft sleeves makes it possible to change the direction of impeller rotation easily in the field without additional parts. Thus, 38 different pump combinations are offered in the new series.

Art Concrete Works Moves Houston Office

Art Concrete Works, Pasadena, Calif., has moved its Houston, Texas, plant to a more convenient location in a new large building of its own at 4817 Holmes Road.

The new site, which includes over 6,000 square feet of inside space for manufacturing and curing, will make it posisble for Art Concrete to offer customers even prompter delivery of orders and improved service in general.

The Houston factory serves Southeast Texas and the great Southwestern area of the United States. Other branches are located in Oakland, Calif.; Portland, Ore.; Shreveport, La.; Birmingham, Ala.; Charlotte, N. C.; Hilaleah and Jacksonville, Fla.

Electric motor operation is recommended for large M & H Gate Valves, or where valves are frequently operated, or where valves are located in remote, inaccessible or hazardous places. The remote control, possible with electric motor operated M & H Valves, is a convenience which frequently increases efficiency and reduces operating costs.

The 36" motor operated M & H Valve illustrated here is standard M & H Gate Valve design and construction—iron body, bronze mounted, double disc, parallel seat. All sizes of electric motor operated M & H Gate Valves are available in Class A for 50 lbs. working pressure, Class B for 100 lbs. working pressure or A.W.W.A. Class C for 150 lbs. working pressure. Furnished with hub, flanged or mechanical joint ends.

M & H Gate Valves may be ordered equipped also with usual accessories such as gearing, by-passes; rollers, tracks and scrapers; double square bottom, indicators, or for hydraulic cylinder operation. For complete information, write or wire M & H Valve and Fittings Company, Anniston, Alabama.

M&H PRODUCTS FOR WATER WORKS • FILTER PLANTS INDUSTRY • SEWAGE DISPOSAL AND FIRE PROTECTION

Rockwell Names Walters Houston District Sales Manager

Rockwell Manufacturing Company, Pittsburgh, Pa., has announced the appointment of J. H. Walters as Houston District Sales Manager. Mr. Walters will be responsible for the coordination of all Meter and Valve Division sales in the Houston District, which covers sections of Texas and Louisiana.

Mr. Walters became affiliated with Rockwell as a Sales Engineer in 1945 and prior to his recent appointment served as Houston Gas Sales Supervisor. He was formerly employed in the Sales Department of the American Meter Company.

Miniature Pneumatic Transmitter

314

The Bristol Company, Waterbury, Conn., has developed a miniature pneumatic transmitter for measuring and transmitting readings of tem-

(Continued on page 113A)

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Please fill out a separate coupon for each item on which you desire information. This will greatly facilitate handling.

Key number is at head of each new product, item of equipment, catalog or bulletin, described in this issue.

Enter key number in box.

Please PRINT your name and title, company or department name, and your address

NOTE—

These cards are to be used only for items described in THIS ISSUE

WATER & SEWAGE WORKS

Will see that you receive information desired.

(*Continued from page* 112A)

perature, pressure, vacuum, differential pressure, and liquid level to recording, indicating, and controlling receivers, including miniature type receivers. Transmission is by means of air pressures of between 3 and 15 psi that have a direct relation to the measured quantity.

This new type of transmitter, known as the Bristol Series 650 Pneumatic Transmitter, uses standard Bristol measuring elements and a simple transmitting mechanism with only one pivot and no flexures. Friction and lost motion are thereby eliminated for all practical purposes. The transmitter is sensitive to extremely small changes in the measured value, as little as 0.03% of range, including reversal. High-speed transmission and superior control result from the use of a pneumatic relay which has an output capacity of 3.0 scfm.

The Series 650 Pneumatic Transmitter, weighing 7½ lbs., is weatherproof and can be installed in any location and will operate in any position.

Rodney Hunt Names Rembe Sales Manager

Phillips Named Ass't. Sales Manager

The Rodney Hunt Machine Co., Orange, Mass., has announced the appointment of Jack W. Rembe as Sales Manager. Mr. Rembe has been export manager of the firm for the past five years and will now direct the sales activities of the company's five product divisions in both domestic and export markets. The product divisions of Rodney Hunt are: textile machinery, industrial rolls, process equipment, water controlling apparatus and water power equipment.

Before becoming associated with the Rodney Hunt Machine Co., Mr. Rembe held supervisory positions in the bleaching, dyeing, finishing and purchasing departments over a twelve-year period with the Cold Spring Bleachery, Yardley, Pa. He was also associated with De Laval Steam Turbine Company in production control.

Langdon M. Phillips, previously field sales manager, will assist Mr. Rembe, sales manager, in directing the sales activities of the company's five product divisions in both domestic and export markets.

Before joining Rodney Hunt Machine Co. four years ago, Mr. Phillips was industrial representative in the Worcester, Mass., office of the Shell Oil Company, Inc., with which he was associated for seventeen years.

Builders Iron Foundry Presents 40 Year Awards

Zechariah Chafee, Jr., Chairman of the Board of Directors of Builders Iron Foundry and Builders-Providence, Inc., Providence, R.I., completed his 40th year of association with B-I-F Industries. Mr. Chafee began his service with Builders in 1907 as assistant to his father, the late Zechariah Chafee, who incorporated Builders Iron Foundry in 1853.

At present, Mr. Chafee is University Professor at Harvard Law School and also does some teaching at the University of Colorado, Columbia University, and University of Chicago.

Along with Mr. Chafee, three other members of Builders Iron Foundry received fortieth year awards.

WET TRENCH NO TROUBLE WITH

McWANE-PACIFIC BOLTITE MECHANICAL JOINT CAST IRON PIPE

An incidental but important advantage of Boltite Mechanical Joint is the elimination of joint-making troubles in wet trenches. There is no danger of hot lead "exploding" due to creation of steam. The Boltite joint consists simply of a thick, triangular-shaped, composition rubber gasket, compressed by a movable gland when the bolts are tightened. There is no hazard in assembling this joint in a wet trench. In fact, it can be done under water.

Boltite Mechanical Joints are bottle-tight, flexible, permit pipe-line expansion or contraction. Perfect joints are easily and quickly made by one inexperienced workman. The only tool needed is a ratchet wrench. Write or telephone for complete information.

McWANE Cast Iron Pipe Company
Birmingham, Ala.
Pipe Sizes 2" thru 12"

Sales Offices

Birmingham 2, Ala.	P. O. Box 2601
Chicago 1, Ill.	333 North Michigan Ave.
New York 4, N. Y.	80 Broad Street
Kansas City 6, Mo.	1006 Grand Avenue
Dallas 4, Texas	3200 Maple Avenue

PACIFIC STATES Cast Iron Pipe Co.
Provo, Utah
Pipe Sizes 2" thru 24"

Sales Offices

Provo, Utah	P. O. Box 18
Denver 2, Colo.	1921 Blake Street
Los Angeles 48, Cal.	6399 Wilshire Blvd.
San Francisco 4, Cal.	235 Montgomery St.
Portland 4, Oreg.	501 Portland Trust Bldg.
Salt Lake City	Waterworks Equip't Co.
Seattle, Wash.	Smith Tower Bldg.

One, Alan A. Wood, a member of the ASME, ASCE and the Engineering Club of Philadelphia, began his association as Sales Engineer. He is now president of Alan A. Wood, Inc., which represents B-I-F Industries in Philadelphia and Washington.

Two brothers, Antonio and Ricardo Deberadis, machine molders in Builders' Foundry, also received recognition and honor for their forty years of service.

These awards are made annually and are presented by Mr. Henry S. Chafee, President. At this year's Service Award Dinner, service pins were presented to eight employees for 25 years service and approximately 199 employees having worked for B-I-F from five to 20 years.

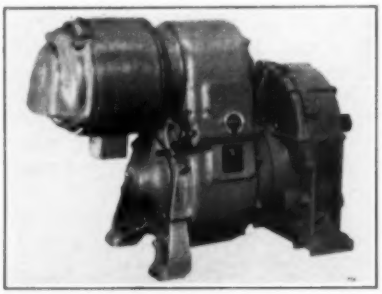
Grooved Pipe Fittings

315

Gustin-Bacon Manufacturing Co., Kansas City, Missouri, has announced a complete new line of Gruvagrip Fittings. These fittings are malleable fittings for grooved pipe, including L's, T's, adapter nipples, crosses, laterals, bull plugs and reducers.

The new fittings come in sizes ¾ to 12 inches and are light, easy to handle, easy to install. Inside walls of Gruvagrip Fittings are true circles, smooth and gently curved to prevent turbulence and frictional losses. Wear is distributed evenly over the entire inner wall because it is free of ridges and pockets.

The manufacturer states that they can be removed from the line without disturbing the rest of the piping system, take paint readily and come painted with a prime coat that contains two types of rust inhibitors.



Heavy-Duty Variable Speed Drive

316

Sterling Electric Motors, Inc., Los Angeles, Calif. has developed a new type KFEB double reduction 20 and 25 H.P. Speed-Trols with speed variation of 2:1, 3:1 and 4:1. The 20 H.P. type 364 KFEB is available with maximum speeds ranging from 176 R.P.M. to 42 R.P.M. and the 25 H.P. type 365 KFEB with maximum speeds ranging from 176 R.P.M. to 64 R.P.M. Efficient power transmission and accurate maintenance of any selected speed are assured by means of Sterling's positively adjusted variable pitch pulleys.

The drip-proof and splash-proof models feature Sterling's direct-through ventilation system. The totally enclosed, fan-cooled model provides a dual cooling system for internal and external cooling.

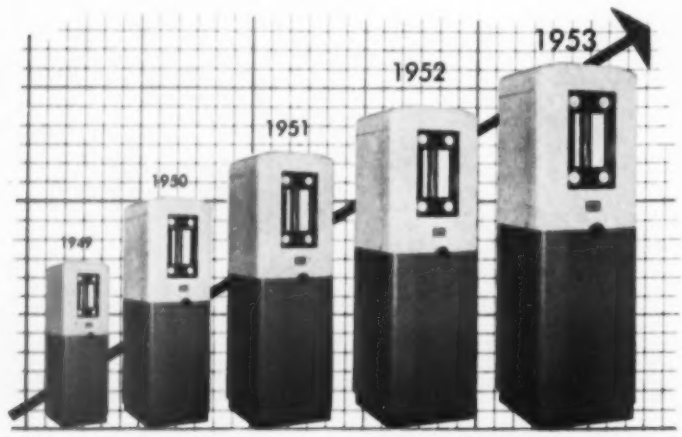
Two New Division Managers at Armco Drainage

Armco Drainage & Metal Products, Inc., Middletown, Ohio, has announced the appointment of two new division managers.

Tom M. Neibling has been appointed manager of the southwestern division of AD&MP, with headquarters at Houston, Texas. He succeeds John Skove, who recently retired.

William O. Robertson has been named manager of the eastern division, with offices at Baltimore, Maryland.

After graduating from the University of Georgia in 1919, Neibling



The trend is to CHLORINIZER

The idea of feeding and metering chlorine gas in its dry non-corrosive state has caught on. Time and again, Builders Visible Flow Chlorinizer has been selected over other makes and types of chlorine gas feeders. Why?

1 — Because the Chlorinizer does not subject vital control and metering components to moist, corrosive chlorine gas . . . this means less maintenance and lower operating expense.

2 — Because the Chlorinizer has a direct reading, positive "visible-flow" indicator — the Sightflo Indicator.

3 — Because the Chlorinizer is extremely easy to change from one capacity range to another, or from manual operation to automatic or flow-proportional operating systems.

4 — Because the Chlorinizer does NOT give off obnoxious chlorine fumes — the tray water is free of strong chlorine odors.

Send today for descriptive Bulletins. Builders-Providence, Inc. (Division of B-I-F Industries), 350 Harris Ave., Providence 1, Rhode Island.

BUILDERS PROVIDENCE *Instruments*

first worked with the Georgia State Highway Department. He joined Armco in 1927, as a district engineer.

After working with the Illinois Central Railroad, Robertson joined Armco in 1929. He advanced through the sales division, working with both drainage and railroad products, and in 1946, became sales engineer of AD&MP's eastern division.

In 1948, he was named sales manager of the division, and held that position until his appointment as manager.

George W. Kelsey

G. W. Kelsey Elected President Builders-Providence, Inc.

Mr. George W. Kelsey was elected President of Builders-Providence, Inc., at the Directors meeting held on February 5. B.-P. is the Instrument Division of Builders Iron Foundry which furnishes municipalities, power plants and industries with Venturi Meters as well as a wide variety of recording, indicating and totalizing instruments for metering and controlling the flow of liquids and dry materials as well as chlorine gas feeders.

Mr. Kelsey came to Builders in 1938 from the U.S. Steel Corporation. He was at one time on the staff at Rutgers University as Associate Professor and prior to that an Industrial Engineer with Tide Water Oil Company.

Earl H. Bradley

E. H. Bradley Elected President Builders Iron Foundry

At a meeting of the Directors of Builders Iron Foundry held February 4, 1953, Mr. Earl H. Bradley was elected President to succeed Mr. Henry S. Chafee. Mr. Chafee will remain as Treasurer of the Company. Mr. Chafee joined Builders Iron Foundry in 1909 and was elected Secretary in 1913, Assistant Treasurer in 1917, Treasurer in 1930 and President in 1944.

Mr. Bradley came with Builders December 26, 1934, and has served in capacities of Shop Superintendent, General Superintendent, Works Manager, Vice President and in 1949 was appointed Executive Vice President.

Tesco Opens New Chlorine Plants

Tesco Chemicals, Inc., Atlanta, Ga., has announced the opening of two new chlorine and ammonia cylinder-filling plants.

These new plants, located in Tampa, Florida, and Thomasville, North Carolina, are modernly equipped for both regular and emergency shipments and will provide the best possible pickup and delivery of the chlorine and ammonia cylinders.

Managed by an experienced staff from the Atlanta, Georgia, main

plant, and supplemented by locally trained personnel, it is planned to later expand these new plant facilities to include the manufacture and distribution of other Tesco products.

Tesco Chemicals, Inc. is the South's largest chlorine and ammonia distributor since acquiring the Southeastern cylinder-filling facilities of the Mathieson Chemical Corporation.

"Hollow Spindle" Stirrer

317

Eberbach Corporation, Ann Arbor, Michigan, has developed a new "Hollow Spindle" Laboratory Stirrer.

With this new stirrer the propeller can be raised or lowered while the motor remains in a fixed position. Using only one propeller, the operator can: (1) vary its working length according to size of vessel employed, and (2) place and remove containers by raising the propeller only, greatly facilitating many stirring operations.

The "hollow spindle" is actually the motor armature with a 5/16" chuck at one end and centering device at the other. The noiseless and sparkless 1550 r.p.m. shaded pole motor develops a substantial torque of 5.195 inch-ounces.

Insul-Mastic Signs Southern Licensees

The Insul-Mastic Corporation of America, Pittsburgh, Pa., has signed contracts with three prominent applicators to represent it in the South. The three companies are:

Industrial Insulators, Inc.
of Borger, Texas

Ozark Insulation Company, Inc.
of Little Rock, Arkansas

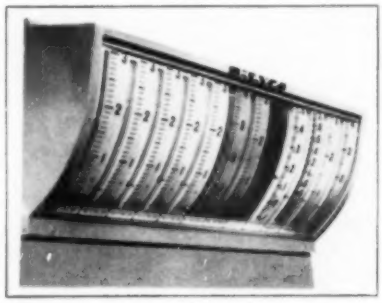
Rust-Proofing, Inc.
of Phoenix, Arizona

The three new licensees are now operating in the industrially expanding South.

Hazlett Joins Neptune

Neptune Meter Company, New York, N.Y., has announced that Merle O. Hazlett has joined its sales force. He will represent the company in the sale of water meters in the States of Montana, Utah and portions of Idaho, Oregon and Washington, making his headquarters at Boise, Idaho.

Mr. Hazlett attended the University of Oregon and left to join the armed forces. He saw action as a fighter pilot with the 15th Airforce in Africa and Italy; and later served as an instructor and test pilot.



Vertiscale Draft Gage

318

The Hays Corporation, Michigan City, Indiana has available the Hays Vertiscale, a new draft gage, which incorporates features that provide many desirable benefits. Among these features are; 3-way atmospheric vent;

The CLEARVUE TEST DIAL

Assures Greater Accuracy in Meter Testing

For 1" and smaller circular dial meters

The Clearvue Test Dial was designed to fit ⅝" and ¾" meters. However, it is large enough to fit most 1" meters. It is not adapted to rectangular registers nor those with sweep hands in the center.

By providing a long test hand over a calibrated transparent plastic dial, the Clearvue Test Dial makes it easy to test meter accuracy at a glance to less than ½ of 1%.

Easy-operating adjustments make this the ideal test dial for series testing of meters on a test bench — one dial for each meter. Special instructions with each dial.

FREE Complete Ford catalog No. 56 of time and money saving meter equipment.

THE FORD METER BOX COMPANY, INC.
Wabash, Indiana

FOR BETTER WATER SERVICES FORD

easy "one man" zero check; large identification label space; magnetic access door; fluorescent lighting for easy reading; removable units; no Paralax, dust tight case; and Lucite scales.

Like other Hays draft and low pressure instruments, the Vertiscale basic operating mechanism consists of a diaphragm, enclosed in a cast metal housing, the force and movement of which is balanced against the force of calibrating springs. The resultant force and movement of the diaphragm is transmitted through linkage to the pointer to indicate the magnitude of the draft, pressure of differential to which the diaphragm element is subjected.

From one to twelve units of the Vertiscale can be mounted side by side in a single case. Streamlined in design this new gage is available in four types of mounting to meet special requirements of individual installations: a semi-flush mounting; a recessed mounting for above eye-level reading; an eye-level mounting and a projected or lug mounting.

The gages can be obtained with a spring loaded metallic bellows for indicating functions such as level, flow, temperature, and pressure pneumatically transmitted by other instruments. Ranges from .2" of water to 120" of water, draft, and differential can be provided.

Inexpensive Purge Rotameters

319

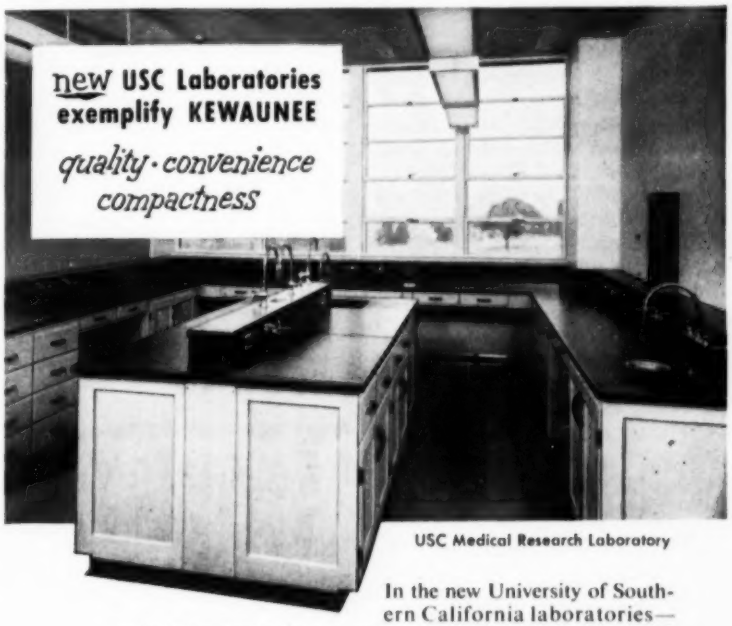
Schutte and Koerting Company, Cornwells Heights, Bucks County, Pa., has developed a new Purge Rotameter designed for use where small, low-cost flow meters are needed to indicate and manually control small flows of fluids with good reproducibility but moderate actual measuring accuracy.

Typical applications include the indication of: flow of supply air in bubbler type liquid level measuring installations; flow of purge fluid, generally water or air, in the pipelines connecting orifices, venturi tubes, or nozzles to differential head flow meters; flow of transparent purge fluid to sight glass indicators of Rotameters measuring the flow of opaque fluids; flow of purge fluid to indicator extensions of indicating Rotameters or to extension wells of Rotameters with electric or pneumatic transmitters where to the process fluid carries slurries, tends to settle out crystals, or may form surface coatings; flow of sample fluid to measuring installations for continuous chemical analysis of fluids.

SK Purge Rotameters must be installed in a vertical position. They can be installed directly in pipelines, on instrument panels or in instrument cases.

F. H. Perfect Joins Atlas Mineral

The Atlas Mineral Products Company, Mertztown, Penna., has announced that Frederick H. Perfect, formerly Director of Research of Kawecki Chemical Company, has joined the Atlas Research Department where he will specialize in research on coatings and linings.



USC Medical Research Laboratory

In the new University of Southern California laboratories—as in laboratories the country over—quality, convenience and compactness of equipment are highly essential. On every count, Kewaunee unit assemblies of custom quality furniture stand out.

Kewaunee casework, cabinets and laboratory furniture—in rugged oak or steel—are designed, engineered and built to meet the most exacting laboratory requirements. All units are interchangeable, permitting greatest flexibility of arrangement for both present needs and future expansion. Quantity production provides true custom quality at modest cost.

Get the facts—consult Kewaunee before you decide.

USC Organic Chemistry Laboratory

Kewaunee Laboratory Equipment catalogs are yours for the asking. Kewaunee Planning Engineers are available for personal consultation without cost or obligation.

Representatives and sales offices in principal cities

Kewaunee Mfg. Co.

5102 S. Center St. • Adrian, Mich.

MANUFACTURERS OF WOOD AND METAL LABORATORY EQUIPMENT

De Laval Opens New District Offices in Minneapolis

With L. P. Mellgren in Charge

De Laval Steam Turbine Co., Trenton, N.J., has announced that Leonard P. Mellgren has been appointed district sales engineer and will head the company's new district offices in Minneapolis, Minn. The new district offices are in the Northwestern Bank Building, Minneapolis, Minn.

Mr. Mellgren will take charge of the district consisting of Minnesota, North Dakota, South Dakota and adjoining sections of Wisconsin including Ashland and LaCrosse. He will be responsible for both the sales and application engineering of De Laval products, which include centrifugal and IMO pumps, steam turbines, speed reducers and centrifugal blowers.

Prior to this appointment, Mr. Mellgren served with the Detroit Stoker Company as sales engineer. Previous engagements included service with the Power Service Company in Minneapolis as mechanical engineer handling layouts and power plant construction estimates, and with the General Electric Company as test engineer.

Lubricating System for Vertical Wet-Pit Pumps

320

Yeomans Brothers Company, Melrose Park, Ill., has developed the Yeomans Lubri-Vac System for vertical wet-pit pumps.

According to the company, Lubri-Vac reduces bearing failures, thereby increasing the life of the pump. The Lubri-Vac System consists of a new impeller with repelling vanes of special design; lubricating lines; and the lubricant. Action of the impeller insures a constant flow of lubricant while the pump is in operation. This flow completely flushes the bearing surface, passes through the impeller, and is discharged.

Action of the impeller while pump is in operation also prevents abrasive materials from working up into the bearing. The impeller action eliminates scoring, scratching and unnecessary wear on the bearing from harsh abrasives and grit.

Marlow Pumps Sets Up Market Research Department

With J. B. Diepenbrock in Charge

Marlow Pumps, Ridgewood, N.J., has announced the appointment of J. B. Diepenbrock, formerly West Coast District Representative, as Manager of a new Marketing Research Department.

As Manager of Market Research, Mr. Diepenbrock will headquarter at the company's main office in Ridgewood, N.J., and coordinate research, engineering and sales data gathered from markets and industries throughout the world. Mr. Diepenbrock was formerly associated with Ingersoll-Rand and Dow Chemical.

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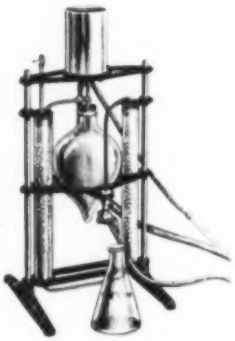

For checking the equilibrium of a finished water, and supplying an index useful in controlling anti-corrosion treatment. Catalog No. 83-895

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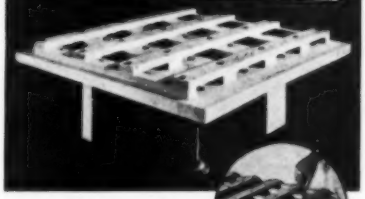
CUT YOUR FILTRATION COSTS



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Write for More Information

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P. O. BOX 1331 • ROCHESTER 3, N. Y.

Literature & Catalogs

New Tapecoat Guide Shows How to Combat Corrosion

321

Tapecoat Company, Evanston, Ill., has just published a new illustrated brochure designed to help solve corrosion problems. The brochure is titled **"Where to Use Tapecoat."**

Based on the company's experience in serving the gas and oil fields, transportation and communication, water, sewage, chemical and industrial applications, the brochure presents practical suggestions to combat corrosion. It includes details on how and where coal tar protection can be used to best advantage and offers case histories to show how corrosive problems have been overcome in many fields.

Sewage and Industrial Waste Treatment

322

Electric Machinery Mfg. Company, Minneapolis, Minn., has released the **E.M. Synchronizer** containing two features on how large sewage pumps are motorized and their function in eliminating pollution of San Francisco Bay and Boston Harbor. A third highly informative article written by a professor of sanitary engineering in one of our country's leading technical colleges describes how strange animals and plants take part in resolving filth into purity.

Fully illustrated throughout, this magazine also includes an article discussing nominal pull-in torque as an important factor to be considered when applying synchronous motors to mixed-flow pumps and other high inertia loads. Two pages of this booklet are devoted to handy ampere tables for quickly determining induction and synchronous motor full-load currents at various standard voltages.

Theory and Application of the Flow Tube

323

Foster Engineering Company, Union, New Jersey, has available a technical bulletin, **"Theory and Application of the Flow Tube,"** by Vincent Gentile, Jr. The bulletin gives hydraulic formulae, head capacity curves and test data for this primary metering element. Also given is a table comparing performance of the Flow Tube vs. Venturi.

The bulletin is a reprint of "Proceedings of the Tenth Annual Appalachian Gas Measurement Short Course 1950," Technical Bulletin No. 31, Engineering Experiment Station, West Virginia University.

"Answer Sheets" for Plastic Pipe Installations

324

The Carlon Products Corporation, Cleveland, Ohio, has announced the availability of two new illustrated leaflets entitled **"Here are the Answers on Flexible Carlon Plastic Pipe"** and **"Here are the Answers on Rigid Carlon Pipe."** They present factual informative answers to the twenty-two most frequently asked questions about CARLON flexible and rigid pipe. They tell what CARLON is, how it is installed, how the price compares with that of metallic pipe, the applications for which it is recommended, etc. The bulletins cover installation precautions, use of CARLON as a temporary line, effects of freezing, manufacturer's guarantee and other subjects of interest to the user. Diameters and weights are listed for rigid "L" pipe

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in sizes from ½ to 2 inches; and diameters, calculated burst pressures, weights and shipping lengths are tabulated for flexible pipe in sizes from ½ to 6 inches.

Detailed instructions for the installation of CARLON pipe are presented and illustrated with step-by-step photographs. They show how CARLON can be cut to desired lengths by means of ordinary handsaw or pipe cutter and how permanent leakproof connections can be made with plastic fittings. Instructions for connecting CARLON plastic pipe to previously installed metallic systems or threaded fixtures are included, and the various types of plastic fittings available are depicted.

Trenchliner Improvements

325

Koehring Company, Milwaukee, Wisconsin, has published a new 16 page catalog on Parsons' improved **Model 250 Trenchliner.** Attractively printed and illustrated, it shows in detail some of the exclusive Trenchliner features that provide greater production speeds and more versatile trenching operation.

The catalog states that with maximum digging capacities of 12½ feet deep and 16 to 42 inches wide, the 250 Trenchliner is equipped to handle municipal and utility construction projects of water, gas, sewer, drainage, pipeline and irrigation systems. The 250 has a range of 30 digging feeds, 3 bucket line and conveyor belt speeds and 4 travel speeds. In addition, a full reverse allows the ladder type boom to undercut effectively and make vertical setins for footings against foundations.

pH and Conductivity Recorders and Controllers

326

Minneapolis-Honeywell Regulator Company, Brown Instruments Division, Philadelphia, Pa., has published a new 24-page catalog that describes and gives details on **Measurement and Control of pH, Redox, and Conductivity.**

The catalog includes easy-to-understand theory behind electrochemical measurement, and gives up-to-date information on recorders, controllers, amplifiers and electrodes. Catalog also contains information on where and how to use automatic pH, Redox, and conductivity measuring and controlling equipment.

Pneumatic Butterfly Control Valves

327

Minneapolis-Honeywell Regulator Company, Brown Instruments Division, Philadelphia, Pa., has published a bulletin on **Pneumatic Butterfly Control Valves.** The bulletin describes butterfly valves designed to regulate the flow of air, gas, liquids or steam in conjunction with indicating, recording, or non-indicating pneumatic controllers. Bulletin also contains application data, specifications, dimensions, and sizing data.

Sewer Scooter

328

Fitzgerald Engineering Corp., Inc., Coral Gables, Florida, has available descriptive and operation data sheets on the **Sewer Scooter.**

The descriptive data sheet describes the Scooter as being 100 percent self propelling—uses the water in the sewer for power to completely clean any type sewer line 6 to 96 inches in diameter.

The operation data sheet gives complete operating instructions and explains in detail the actions of the Scooter in cleaning the pipe.

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One Man Operation

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Dorrco Bar Screen, Dorrco Sulzer Disintegrator

329

The Dorr Company, Stamford, Conn., has announced the availability of a new 24-page, two-color bulletin, **"The Dorrco Bar Screen and the Dorrco Sulzer Disintegrator."** It describes in detail the two types of Dorrco Bar Screens, the Dorrco Sulzer Disintegrator, and the units in combination. Photographs and detail drawings are included as well as a section on Bar Screen control mechanisms.

According to the bulletin the Bar Screen - Disintegrator combination provides an answer to the entire screening-handling problem. Large solids are collected by the screen, completely ground to a "mealy" consistency in the Disintegrator, and then returned to the sewage for normal plant treatment. The operation of both units is governed by a fully automatic control system which insures maximum efficiency and economy.

Pipeline Trencher

330

Cleveland Trencher Company, Cleveland, Ohio, has published a new 4-page bulletin on the **Cleveland Model 320** trencher.

The folder contains many photographs presenting the 320 in action under all types of job and weather conditions. Text briefly outlines Cleveland advantages and special design features.

Complete dimensions and specifications, including a table of optional cutting widths, are also contained in the 2-color folder.

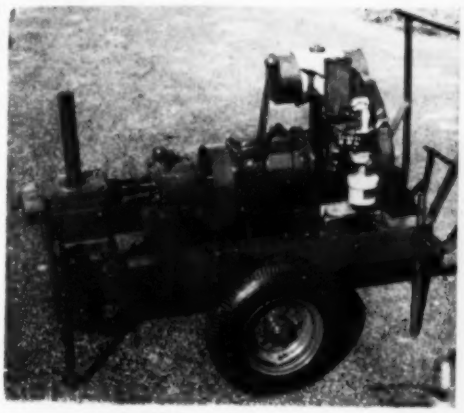
Protect Pipe From Corrosion

331

Minnesota Mining & Manufacturing Co., St. Paul, Minn., has recently published a booklet on **Scotchrap Pipe Insulation, No. 50 and No. 51.**

This amply illustrated booklet describes the tapes as being a poly-

(Continued on page 125A)



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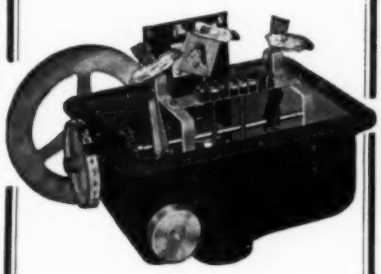

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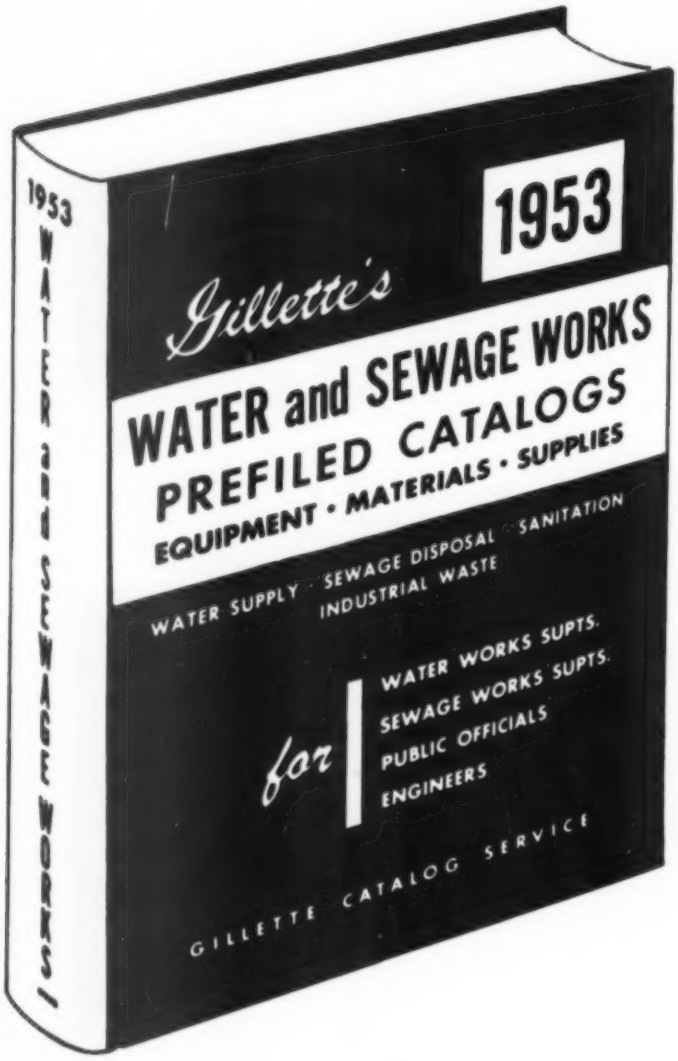

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(*Continued from page* 121A)

vinyl chloride film with high stretch and close molding properties and a pressure-sensitive adhesive that grabs on contact and holds permanently. They are said to provide protection against corrosive soil chemicals, oils, and fats, stray ground currents, soil bacteria and fungi.

The booklet shows, by means of photographs and explanatory text, techniques for both hand and machine wrapping.

Water and Sewage Works Painting Charts

332

Inertol Co., Inc., Newark, New Jersey, has available two charts: **Water Works Painting Chart** and **Sewage Plant Painting Chart.**

These informative charts provide a guide to the proper selection of both primer and finish coats on concrete, brick, plaster, steel and wood. The particular type of conditions (dry, damp, or submerged) that the paint will be exposed to is also taken into consideration. Detailed descriptions of all recommended primers, undercoaters and finishes are given and a master color chart accompanies each painting chart.

Municipal Supplies

333

U. S. Darley & Co., Chicago, Ill., has released the 1953 catalog of **Municipal Supplies** handled by the company.

The 100 page catalog lists over 350 different items in the index that are of interest to municipalities, of which over 100 items are used by water and sewage plants. Photographs or drawings accompany most of the items along with complete descriptions and prices.

Other municipal supplies shown include traffic signals, police equipment, street equipment and fire equipment.

SK Spray Nozzles

334

Schutte and Koerting Co., Cornwells Heights, Pa., has just issued a bulletin containing complete technical details on the line of atomizing and **Spray Nozzles** manufactured by the company.

Atomizing Nozzles, Spray Nozzles, and Spray Nozzle Clusters are treated in separate sections of the bulletin. Information given for each type of Spray Nozzle includes: construction details, spray characteristics, and capacities. Dimension tables, capacity charts, and drawings supplement text material.

Pocket Calendar, Gage & Weight Tables

335

Armco Drainage & Metal Products, Inc., Middletown, Ohio, is offering its handy new plastic pocket calendar for 1953. The sides of the calendar are 3-inch rules, marked off in 16th and 10th inches. On the other side a sheet steel gage table, circular areas table, corrugated metal pipe weight table, and section moduli for various construction products, are shown.

Simple Recorder Controller

336

The Foxboro Company, Foxboro, Mass., has just published a 16-page illustrated bulletin describing the restyled **Foxboro Circular Case Controller.** This instrument, automatically controls temperature, pressure, liquid level, humidity or other process variables.

Showing typical applications, the bulletin discusses each unit of a pneumatic control system, from the measuring element to the control valve. A section of installation diagrams and text is devoted to on-off and proportional control, explaining how to select the appropriate controller action to match the demands of a process. Instrument components and their individual functions in the control of such equipment as storage type heaters and refrigerators, retorts, kettles, kilns and dryers are thoroughly covered.

A two-page data section analyzes the four classes of measuring systems available for automatic temperature control, illustrating a variety of temperature bulbs, sockets, flanges and other accessory equipment. Measuring elements for automatic pressure control are also shown. Other pages feature indicating controllers, Rotax electric controllers, chart records, instrument specifications and mounting dimensions.

Saran-Lined Venturi Nozzle

337

Builders-Providence, Inc., Providence, Rhode Island, has just issued a new bulletin on the **Saran-Lined Venturi Nozzle.**

The Model NZSL is a flanged type differential producer without piezometer rings, designed for corrosive liquids and slurry service.

This bulletin gives pertinent information of the uses of the Saran-Lined Nozzle and shows a sectional view of the Model NZSL.

The bulletin gives a list of corrosive liquids that can be metered with the Saran-Lined Nozzle, also ratio chart and capacity table for obtaining capacities for liquids other than water.

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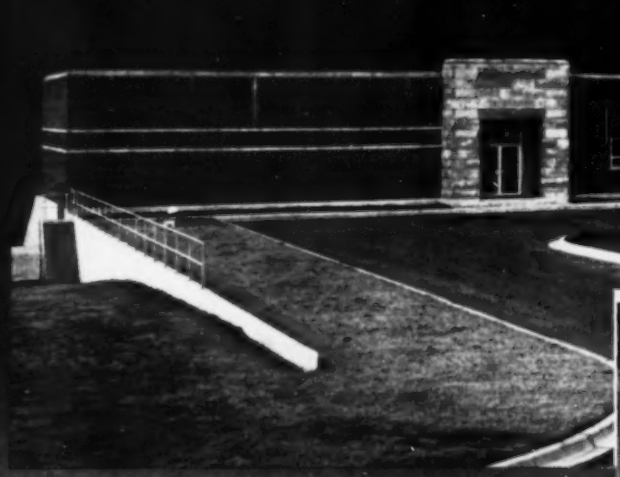

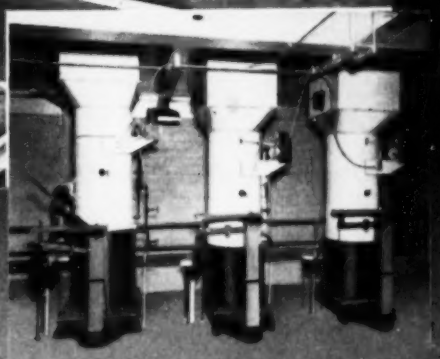

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